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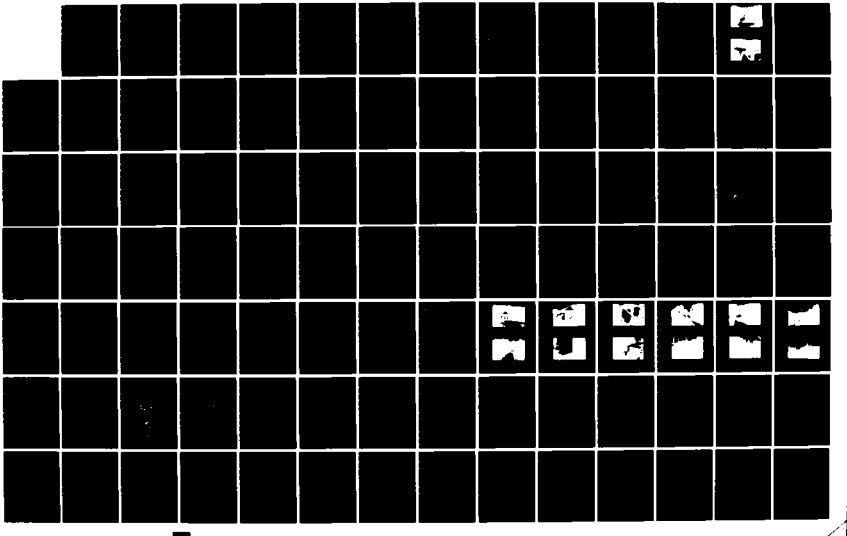
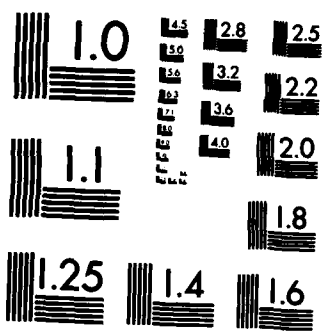




CONNECTICUT RIVER BASIN

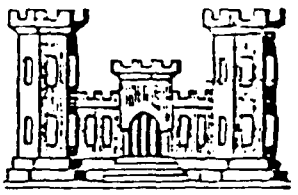
LEYDEN , MASSACHUSETTS

UPPER GLEN (GREENFIELD) RESERVOIR DAM

MA 00049

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

MARCH 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Upper Glen (Greenfield) Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Leyden, Massachusetts

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Upper Glne (Greenfield) Reservoir Dam is 48 foot high composite masonry and rock fill embankment dam. Its crest is approximately 270 feet long, the upstream face is nearly vertical, the top width is about 19 feet and the stepped rock-fill slope averages 1H:1V. The dam appears to be in good overall condition. The recommended range for the test flood for an "Intermediate" size, "Significant" hazard dam is from ½ of the PMF.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

APR 2 1981

NEDED

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Upper Glen (Greenfield) Reservoir Dam (MA-00049) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Town of Greenfield, Department of Public Works, Water Division, Town Offices,Court Square, Greenfield, MA 01301.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

C.E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

UPPER GLEN (GREENFIELD) RESERVOIR DAM
MA 00049

CONNECTICUT RIVER BASIN
LEYDEN, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification Number:	MA 00049
Name of Dam:	Upper Glen (Greenfield) Reservoir Dam
Town:	Leyden
County and State:	Franklin County, Massachusetts
Stream:	Glen Brook
Date of Inspection:	December 3, 1980

BRIEF ASSESSMENT

Upper Glen (Greenfield) Reservoir Dam is a 48-foot high composite masonry and rock-fill embankment dam, spanning the lower portion of a 300-foot deep valley. Its crest is approximately 270 feet long, the upstream face is nearly vertical, the top width is about 19 feet and the stepped rock-fill slope averages 1H:1V. The dam which impounds a reservoir used for water supply for the Town of Greenfield was originally constructed in 1912 and extensively modified and improved in 1927.

The dam appears to be in good overall condition. The 4-foot thick concrete wall forming the crest of the dam appears to be properly aligned and no evidence of structural cracking or settlement was observed. The downstream rock-fill embankment also appears to be stable with no signs of seepage observed. Varying degrees of spalling and cracking are evident on concrete surfaces other than the above mentioned wall.

Upper Glen (Greenfield) Reservoir Dam has a maximum storage capacity of approximately 143 acre-feet and a maximum height of about 48 feet. According to guidelines established by the Corps of Engineers, it is an "Intermediate" size structure. If Upper Glen (Greenfield) Reservoir Dam were to fail, appreciable property damage, but little or no loss of life could be expected at the hazard area located approximately 2.1 miles downstream of the dam. Therefore, the hazard classification for the dam is "Significant". The recommended range for the test flood for an "Intermediate" size, "Significant" hazard dam is from one-half of the Probable Maximum Flood (PMF) to the full PMF. The selected test flood for the dam assessment is one-half of the PMF.

The test flood peak inflow to Upper Glen (Greenfield) Reservoir was computed to be 3,690 cfs. The test flood peak outflow is also 3,690 cfs, with an overtopping depth of about two feet. The spillway has a discharge capacity of 2,160 cfs, or about 59 percent of the routed test flood outflow, just prior to overtopping of the dam.

Within two years after receipt of this Phase I Inspection Report, the Owner, the Town of Greenfield, should retain the services of a qualified registered professional engineer, experienced in the design and construction of dams, for the following purposes: 1) perform detailed hydrologic and hydraulic analyses to assess the need for increasing the project discharge capacity and to evaluate the ability of the structure to withstand overtopping; and 2) assess the structural integrity of the west side spillway training wall.

In addition, the Owner should implement the following operational and maintenance procedures: 1) operate and repair, if needed, the outlet works to verify their reliable operation; 2) develop and implement an operation and maintenance program; 3) institute an annual technical inspection; 4) repair the spalled concrete on the foundation walls of the gatehouse and on the access bridge over the spillway; and 5) develop a formal downstream warning system.

O'BRIEN & GERE ENGINEERS, INC.

John J. Williams, P.E.
Vice President
Massachusetts Registration No. 30208

COMMONWEALTH OF MASSACHUSETTS
JOHN JAY WILLIAMS
No. 30208 (CIVIL)
REGISTERED PROFESSIONAL ENGINEER

Date: 2 March 81

This Phase I Inspection Report on Upper Glen (Greenfield) Reservoir Dam (MA-00049) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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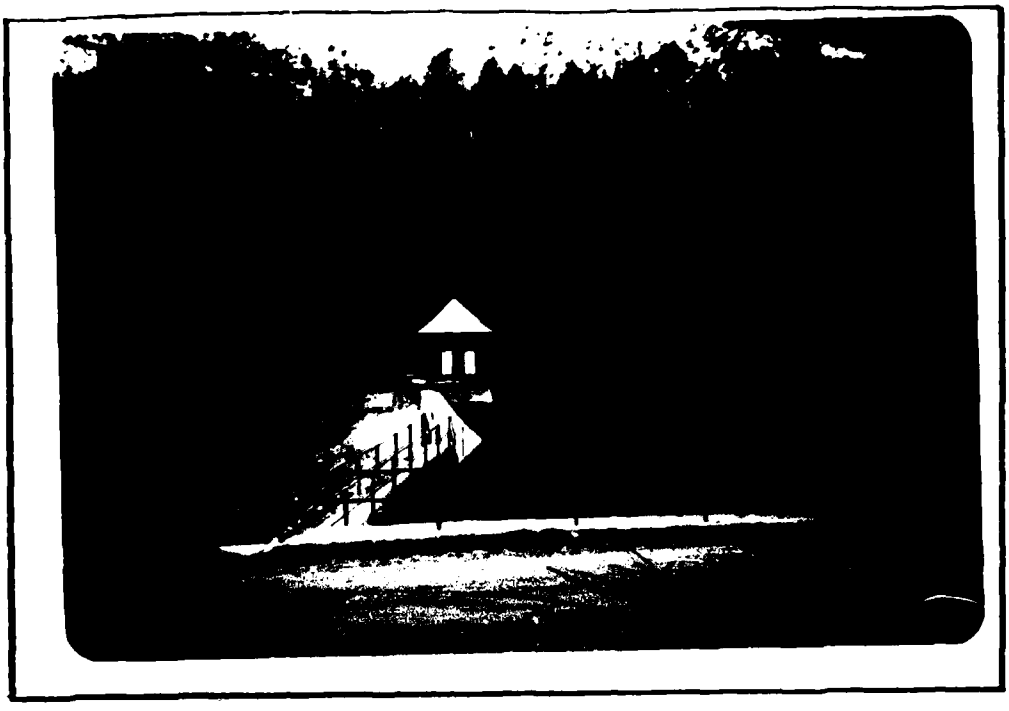
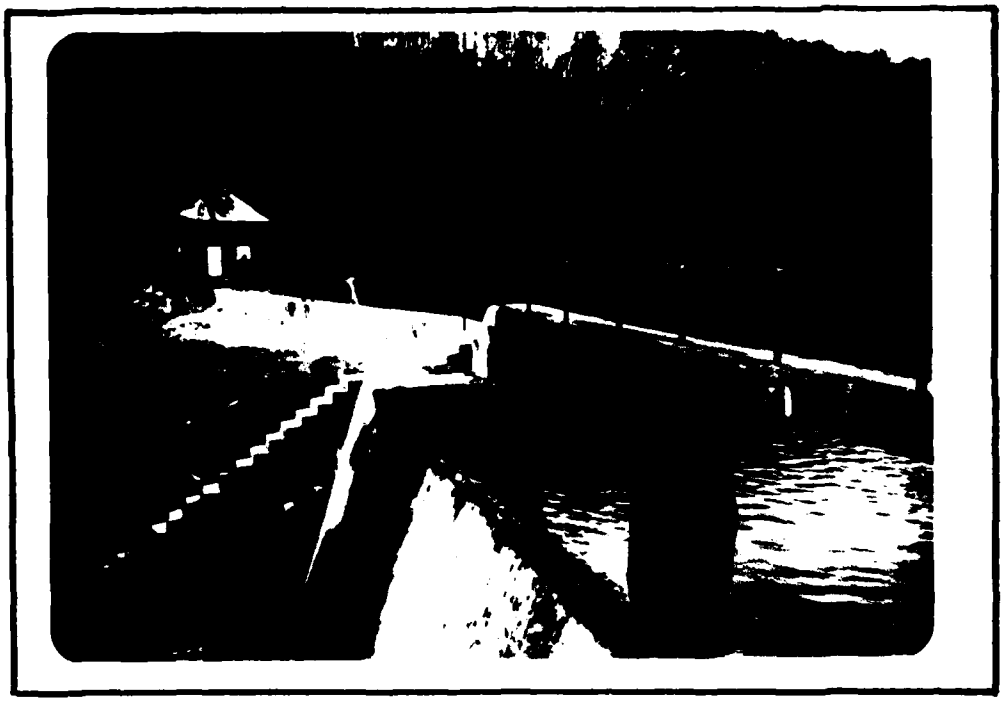


UPSTREAM OVERVIEW OF THE DAM FROM THE LEFT ABUTMENT.
(12/3/80)



DOWNSTREAM OVERVIEW OF THE DAM FROM THE LEFT ABUTMENT.
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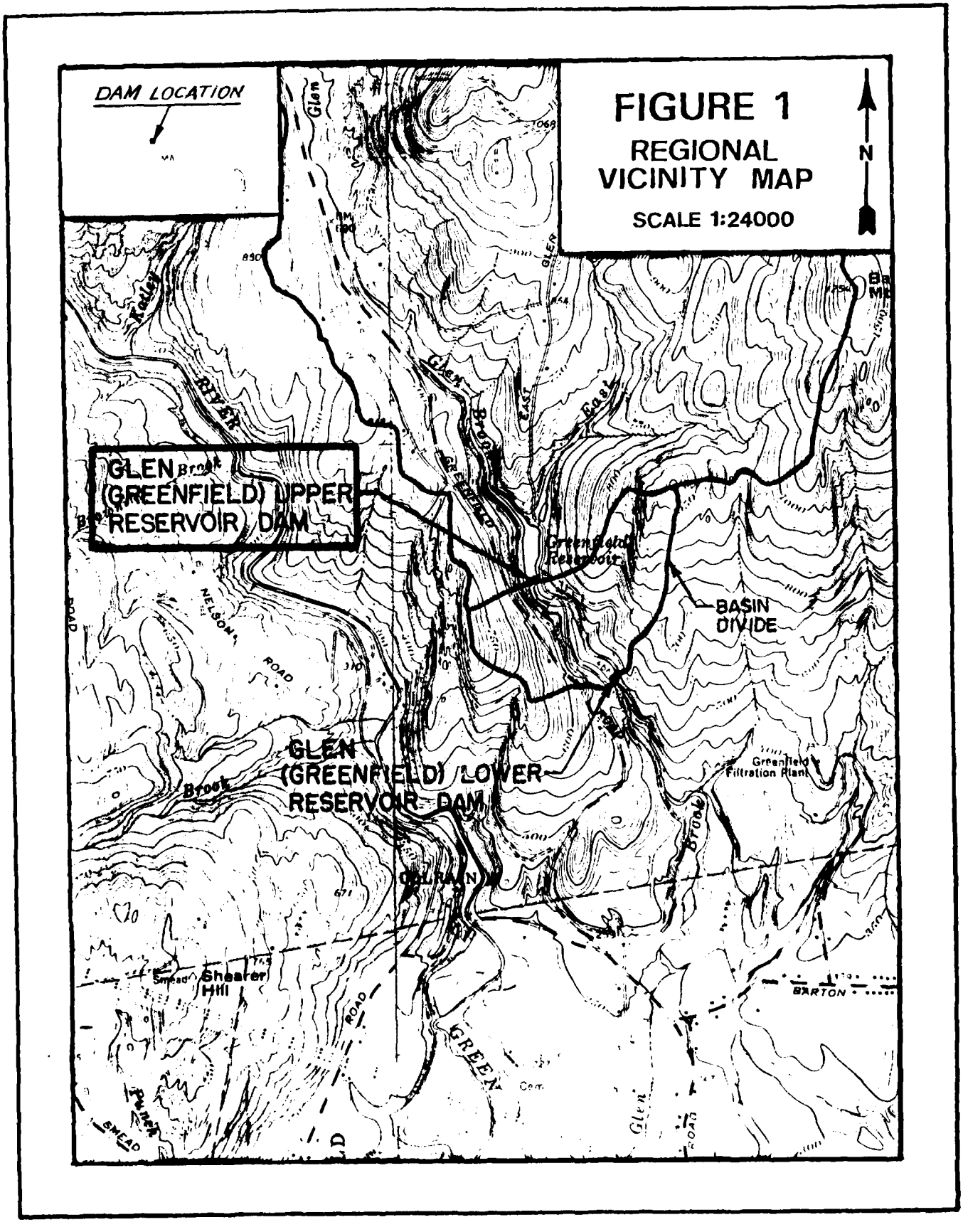

DAM LOCATION
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24000
N
GLEN (GREENFIELD) UPPER RESERVOIR DAM
GLEN (GREENFIELD) LOWER RESERVOIR DAM
BASIN DIVIDE
Greenfield Reservoir
Greenfield Filtration Plant
NELSON ROAD
Shearer Hill
BARTON
GREEN
Glen Brook
RIVER
ROAD

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367) was passed by Congress on August 8, 1972. Under this Act, the Secretary of the Army was authorized to initiate, through the Corps of Engineers, the National Program for Inspection of Dams throughout the United States. Responsibility for supervising inspection of dams in the New England Region has been assigned to the New England Division of the Army Corps of Engineers.

O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected non-federal dams in the Commonwealth of Massachusetts. Authorization and Notice to Proceed were issued to O'Brien & Gere Engineers, Inc. by a letter dated November 12, 1980 and signed by Col. William E. Hodgson, Jr. Contract No. DACW33-81-C-0016 has been assigned by the Corps for this work.

b. Purpose. The purpose of inspecting and evaluating non-federal dams is to:

1. Identify conditions which threaten public safety and make the Owner aware of any deficiencies so that he may correct them in a timely manner.

2. Encourage and prepare the state to initiate an effective dam safety program for non-federal dams as soon as possible.

3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project (Information with respect to this dam was obtained from Mr. James Cook, Engineer for the Town of Greenfield.)

a. Location. Upper Glen (Greenfield) Reservoir Dam is located on Glen Brook in the Town of Leyden, Massachusetts. Glen Brook flows southeasterly from the dam to the Lower Glen (Greenfield) Reservoir and continues in a southerly direction for approximately 2.5 miles to the Green River. Thence, the Green River flows generally to the south for approximately 5 miles to its point of confluence with the Deerield River. From that point, the Deerfield River flows easterly for approximately 2 miles to join the Connecticut River. To illustrate the location, portions of the USGS quadrangle maps entitled "Colrain, Mass.-Vt." and "Bernardston, Mass.-Vt." have been put together and included as Figure 1 on page vi of this report. USGS reference coordinates for this dam are N42°39.6' and W72°36.9'.

b. Description of Dam and Appurtenances. Upper Glen (Greenfield) Reservoir Dam is a composite masonry and rock-fill gravity structure. It is approximately 270 feet long with a maximum height of 48 feet. The top of the dam is approximately 19 feet wide and has a five-foot high and four-foot thick concrete

wall at its upstream face. The entire upstream of the face of the dam is nearly vertical, while the downstream face consists of a stepped rock-fill embankment, predominantly sloped at 1H:1V. A gatehouse is located approximately 50 feet in from the west abutment.

The dam is believed to be founded on bedrock. The abutments consist of vertically bedded outcroppings of what appears to be schist. Similarly, a weathered rock channel lies just downstream of the dam.

A rectangularly shaped, broad-crested spillway is located at the east abutment. It is 45 feet wide and its invert is approximately seven feet lower than the crest of the dam (top of the concrete wall). A four-foot wide concrete walkway has been constructed over the spillway to provide access to the gatehouse. The spillway channel consists of a very steep rock-cut waterway which winds its way southwesterly toward the center of the dam and discharges to Glen Brook. Several drawings and photos of the dam are included in Appendix B and Appendix C, respectively.

Several outlet valves and four sluice gates are incorporated into the structure to draw water from the reservoir. A 24-inch diameter low level outlet, located just to the east of the gatehouse, has a 24-inch square sluice gate equipped with an extended stem and hoist for hand crank operation. (See photos 1 and 2, Appendix C). In addition, plans of the dam show two additional 24-inch diameter gate valves located on the same outlet pipe. The other main outlet through the dam is a 30-inch diameter water supply main which originates at the gatehouse. Three, 36-inch square sluice gates are located in the gatehouse and may be operated to draw water from the reservoir at various levels. A 12-inch diameter valve near the downstream toe of the dam provides the primary means for draining the reservoir. Sketches of the outlet piping and the layout of the sluice gate operators in the gatehouse are included in Appendix B.

c. Size Classification. Upper Glen (Greenfield) Reservoir Dam has a maximum storage capacity of approximately 143 acre-feet and a maximum height of about 48 feet. Because the dam is greater than 40 feet and less than 100 feet high, Upper Glen (Greenfield) Reservor Dam is classified as an "Intermediate" size structure.

d. Hazard Classification. Failure of Upper Glen (Greenfield) Reservoir Dam would result in a surge of flow being released to Glen Brook, routed through Lower Glen (Greenfield) Reservoir, and then routed approximately 1.6 miles further along Glen Brook to the downstream hazard area. Based upon a computer analysis of a hypothetical breach of the dam, flow to a depth of 1.5 feet above the first floor door sill would occur at the house on the farm (Refer to Page B-2) at the damage center. Because it is likely appreciable property damage would result, with little or no loss of life anticipated, Upper Glen (Greenfield) Reservoir Dam is classified as a "Significant" hazard structure.

e. Ownership. The dam is owned by the Town of Greenfield, Department of Public Works, Water Division. Town Offices - Court Square, Greenfield, Massachusetts 01301. Telephone: (413) 772-0166).

f. Operator. Dams owned by the Town of Greenfield are operated through the Department of Public Works - Water Division. Mr. Richard Michand, Water Foreman, and Mr. James Cook, Engineer for the Town of Greenfield are responsible for operation and maintenance of the dam.

g. Purpose of the Dam. The dam was constructed in 1912 to impound water for water supply purposes. Upper Glen (Greenfield) Reservoir is still being used as the primary source of water for the Town of Greenfield.

h. Design and Construction History. Upper Glen (Greenfield) Reservoir Dam was constructed in 1912, eight years after Lower Glen (Greenfield) Reservoir Dam was completed. Apparently, Upper Glen (Greenfield) Reservoir Dam was constructed to provide a gravity-feed water supply source for Greenfield so that pumping water from Lower Glen (Greenfield) Reservoir could be eliminated. Further information with regard to the original construction of the dam is not available.

The dam was raised and improved in 1927. The modifications included the following:

1. Construction of a three-foot high concrete wall at the upstream face of the dam, including a new access walkway over the spillway.

2. Placement of a stepped rock-fill embankment on the downstream face of the dam.

3. Placement of a two-inch thick layer of gunite on the upstream face of the dam.

4. Increased the spillway capacity by enlarging the spillway and constructing a concrete training wall (see drawings in Appendix B).

5. Installed a new outlet piping system to facilitate more flexible and reliable operation.

Since that time, there have been no major modifications and only one major rehabilitation contract. In 1975, three new sluice gates were installed at the gatehouse and the upstream face of the dam was repaired with gunite.

i. Normal Operating Procedures. Water from the reservor is normally permitted to flow by gravity through wire mesh screens and the intermediate level sluiceway to a 30-inch diameter water main. The main and intermediate level sluice gates are normally open, while the low level sluice gate is kept closed. Should it become necessary to clean the water main or to shut off the flow of water, the operator would close a gate valve located in a vault just downstream of the dam.

1.3 Pertinent Data

a. Drainage Area. The watershed for Upper Glen (Greenfield) Reservoir consists of 5.2 square miles of primarily steep and wooded terrain. Very little development has taken place in the watershed.

b. Discharge at Damsite.

1. Outlet Works. The outlet works consist of a gated 24-inch diameter low level outlet and a 30-inch diameter water supply line. In addition located just downstream of the dam is a gated 12-inch diameter drain from the water supply

line. Inverts for the above elements of the outlet works are not available from the Town of Greenfield.

2. Maximum Known Flood at Damsite. Unknown

3. Ungated Spillway Capacity at Top of Dam. The spillway capacity with the reservoir pool at top of dam Elevation 533.0 is approximately 2,160 cfs.

4. Ungated Spillway Capacity at Test Flood Elevation. The spillway capacity with the reservoir pool at test flood Elevation 535.0 is approximately 2,700 cfs. Note that a portion of the spillway is obstructed by the access bridge at test flood Elevation 535.0

5. Gated Spillway Capacity at Normal Pool. Not applicable.

6. Gated Spillway Capacity at Test Flood Elevation. Not Applicable.

7. Total Spillway Capacity at Test Flood Elevation. The spillway capacity with the reservoir pool at test flood Elevation 535.0 is approximately 2,700 cfs. Note that a portion of the spillway is obstructed by the access bridge at test flood Elevation 535.0.

8. Total Project Discharge at Top of Dam. The spillway capacity with the reservoir pool at top of dam Elevation 533.0 is approximately 2,160 cfs.

9. Total Project Discharge at Test Flood Elevation. The total project discharge with the reservoir pool at test flood Elevation 535.0 is 3,660 cfs.

c. Elevation. (NGVD)

1.	Streambed at Toe of Dam	±485
2.	Bottom of Cutoff	Unknown
3.	Maximum Tailwater	Unknown
4.	Normal Pool	526
5.	Full Flood Control Pool	NA
6.	Spillway Crest	526
7.	Design Surcharge (Original Design)	Unknown
8.	Top of Dam	533
9.	Test Flood Surcharge	535

d. Reservoir Length. (Feet)

1.	Normal Pool	1,750
2.	Flood Control Pool	NA
3.	Spillway Crest Pool	1,750
4.	Top of Dam Pool	1,870
5.	Test Flood Pool	1,910

e. Storage. (Acre-Feet)

1.	Normal Pool	92
2.	Flood Control Pool	NA
3.	Spillway Crest Pool	92
4.	Top of Dam Pool	143
5.	Test Flood Pool	159

f. Reservoir Surface. (Acres)

1.	Normal Pool	6.7
2.	Flood Control Pool	NA
3.	Spillway Crest Pool	6.7
4.	Top of Dam Pool	7.1
5.	Test Flood Pool	7.7

g. Dam Data.

1.	Type	Stone Masonry and Rock Fill
2.	Length	270 feet
3.	Height	48 feet
4.	Top Width	19 feet
5.	Side Slopes (Upstream)	Vertical
	(Downstream)	1H:1V
6.	Zoning	Masonry and Rock Fill
7.	Impervious Core	Concrete Gravity Section
8.	Cutoff	Concrete Gravity Section
9.	Grout Curtain	None

h. Diversion and Regulating Tunnel. Not Applicable

i. Spillway.

1.	Type	Broad Crested Concrete Weir
2.	Length of Weir	45 feet
3.	Crest Elevation	526
4.	Gates	None
5.	Upstream Channel	Reservoir
6.	Downstream Channel	Glen Brook

j. Regulating Outlet. (Low Level Outlet)

1.	Invert Elevation, Inlet	Unknown
2.	Invert Elevation	±480
3.	Size	24-inch
4.	Description	Circular, Gated
5.	Control Mechanism	Sluice Gate with Extended Stem Operator

SECTION 2

ENGINEERING DATA

2.1 Design

Information with respect to the original design of the dam is not available. The only available information are plans and specifications for modifications made to the dam around 1927.

2.2 Construction

Plans and specifications for modifications made to the dam in 1927 present construction information for the following components of the dam:

1. Rock-fill embankment
2. Concrete wall at upstream face of the dam.
3. Spillway channel construction.
4. Outlet works.

2.3 Operation

Upper Glen (Greenfield) Reservoir is the primary water supply source for the Town of Greenfield. The dam is visited every day to check the intake bars and record stage reading when the water surface in the reservoir is below the spillway crest.

Normal operating conditions consist of water flowing by gravity through the intake bars, the intermediate level sluiceway and the 30-inch diameter water supply main en route to the Town's water filtration plant. The main sluice gate at the gatehouse is normally kept open while the low level sluice gate is closed. The other outlet works, a 24-inch diameter low level outlet and a 12-inch diameter valve from the water supply main, are operated only when necessary. Currently, the low level outlet cannot be opened until the worm gear for the gate operator is replaced. The 12-inch diameter valve was last operated five years ago when the reservoir was drained for maintenance.

Steps have been taken by the Water Division personnel to prevent unauthorized operation of outlet works at the site. The worm gear from the operator for the low level outlet and the hand cranks used to operate the sluice gates in the gatehouse are stored away from the site.

2.4 Evaluation

a. Availability. Plans and specifications of modifications made to the dam in 1927 and two drawings of the original dam's construction are available from the Town of Greenfield Department of Public Works - Water Division.

b. Adequacy. The aforementioned information, along with information obtained during visual inspection of the dam proved adequate for a Phase I assessment of the dam.

c. Validity. The information obtained from the Town appears to be in general conformance with the field measurements.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. Upper Glen (Greenfield) Reservoir Dam was inspected on December 3, 1980. At the time of inspection, the reservoir pool was slightly above the spillway crest El. 526 given on the modification drawings of the dam. Underwater areas were not inspected.

The observations and comments of the field inspection team are noted on a checklist included as Appendix A of this report.

b. Dam. The dam is located in a narrow valley with very steep outcroppings of what appears to be schist forming the valley walls. The west abutment is heavily forested with both deciduous and coniferous trees. The east abutment is formed by a concrete retaining wall and access road. No trees are growing in this area. A steeply sloped rock-cut spillway follows along the eastern abutment. It is bordered by coniferous trees to the east and near the toe of the dam.

The dam appears to be in good overall condition. The four-foot wide concrete wall forming the crest of the dam appears to be in good condition. The top of the dam is covered by a moderate growth of grass and no indications of settlement were noted. The downstream face of the dam is formed by a rock embankment sloped at approximately 1H:1V. Only in a few locations were any displacements of stones noted. No evidence of seepage was observed.

c. Appurtenant Structures. A brick gatehouse is located approximately 50 feet in from the west abutment. It has a concrete foundation with some surface spalling observed above the water surface (see Photo 4 in Appendix C), but overall appears to be in fairly good condition. The windows have been replaced with plywood panels to help discourage vandalism. The sluice gates in the gatehouse were replaced in 1975; therefore, they appear to be in very good condition. Intake bars located on the north wall of the gatehouse have three-inch spacings.

A 45-foot long spillway is located at the east abutment. It consists of a 10-foot wide, broad crested masonry weir and a very steep rock cut discharge channel which follows along the east abutment of the dam. The east side of the spillway is bordered with coniferous trees, as is the west side of the spillway channel below the toe of the dam. The west side of the spillway is formed by a concrete retaining wall which shows evidence of cracking in many locations from the bottom to the top of the spillway. From observation it is not possible to judge how deep the cracks may extend. The largest cracks in the vicinity of the top of the wall appear to be about 0.25 inches. (See photo 6 in Appendix C.)

The access bridge to the operator for the 24-inch diameter low-level outlet appears to be in good condition. As shown in photo number 2, it appears to have been recently painted. According to Mr. Richard Michand, Water Foreman, the crank and the worm gear for the operator have been removed to prevent unauthorized operation. For a more detailed description of the outlet works, refer to Section 1.2b.

The access bridge over the spillway appears to be in good condition except for some minor spalling of concrete.

d. Reservoir Area. The entire perimeter of the reservoir consists of generally steep and forested terrain. No evidence of slope instability is apparent and no evidence of excessive siltation in the reservoir could be observed.

e. Downstream Channel. Glen Brook follows a moderately sloped channel through weathered rock and boulders. Coniferous trees overhang the channel at several locations, but do not significantly obstruct flow. A concrete arched culvert, located approximately 700 feet downstream of the dam, lies between the Upper and Lower Glen (Greenfield) Reservoirs.

3.2 Evaluation

The dam is considered to be in good overall condition. Operation and maintenance of most of the features of the dam are considered adequate; however, action must be taken on the following items:

1. Cracking of the west side spillway training wall.

2. Spalling of concrete on the foundation walls of the gatehouse and on the access bridge over the spillway.

3. The crank and the worm gear for the 24-inch diameter low level outlet sluice gate operator are not kept at the site.

SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 Operation Procedures

a. General. According to the Owner's representative, normal operation includes allowing the water to flow through the intake bars, the intermediate level sluiceway, and the 30-inch diameter water supply main to the town's water filtration plant. The main sluice gate in the gatehouse is kept open while the low level gate is closed. The other outlet works are used only when necessary, as discussed in Section 2.3. The operator for the dam visits the site daily to check the intake bars and to record the stage readings if the reservoir is below the spillway crest.

b. Description of Any Warning System in Effect. According to the Owner's representative, during periods of extended snowmelt and/or rainfall, a representative of the Public Works Department periodically monitors conditions at the dam. The residents in the downstream hazard area would be notified if the water level approached the top of the dam.

4.2 Maintenance Procedures

a. General. According to the Owner's representative, maintenance at the dam is performed as needed. No maintenance is performed on a routine basis.

b. Operating Facilities. According to the Owner's representative, the sluice gates in the gatehouse were replaced and the upstream face of the dam was repaired in 1975. Since that time, no major maintenance has been required. The reservoir drain was last exercised in 1975 when it was opened to drain the reservoir, but the low level outlet for water supply has not been operated for a longer period of time. Some concern was expressed that silt or other debris would interfere with closure of the low level water supply sluice gate.

4.3 Evaluation

The current operation and maintenance program is considered fair. A comprehensive operation and maintenance program should be developed and implemented and an annual technical inspection should be instituted. A more formal warning system should be developed.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Upper Glen (Greenfield) Reservoir Dam has a relatively steep and forested watershed of 5.2 square miles, ranging from El. 1275 in the upper reaches of Brandy Brook to El. 526 at normal pool elevation. Glen Brook, the primary tributary to Upper Glen (Greenfield) Reservoir, originates approximately 3.7 miles to the northwest of the dam and flows approximately 0.2 miles downstream of the dam to Lower Glen (Greenfield) Reservoir. The normal storage in Upper Glen (Greenfield) Reservoir is approximately 92 acre-feet.

5.2 Design Data

According to the Owner's representative, no hydraulic or hydrologic design information is available.

5.3 Experience Data

The only known records are stage records for the reservoir pool when the water in the reservoir is below the spillway crest. It is not known if the dam has ever been overtopped.

5.4 Test Flood Analysis

The recommended test flood range for an "Intermediate" size, "Significant" hazard dam is from one-half of the probable maximum flood (PMF) to the full PMF. Due to the potential for appreciable property damage with little possibility of loss of life at the hazard area, the selected test flood is one-half of the PMF.

Hydraulic and hydrologic calculations were performed with the assistance of the HEC-1-DB computer program. Flood hydrographs were developed from Snyder unit hydrographs using average coefficients, an initial infiltration value of zero, and a constant loss rate of 0.05 inches per hour. The Hop Brook Adjustment Factor[1] was used to reduce the probable maximum precipitation based upon the size of the drainage area. The routing analysis consisted of constructing the inflow hydrograph to Upper Glen (Greenfield) Reservoir and routing it through the site. Stage vs. discharge and stage vs. storage relationships were developed to obtain the outflow hydrograph. The reservoir pool was assumed to be at the spillway crest at the beginning of the storm event.

The peak test flood inflow to Upper Glen (Greenfield) Reservoir was computed to be 3,690 cfs. A peak outflow of 3,690 cfs was routed through the site with an overtopping depth of two feet. The spillway has a discharge capacity of 2,160 cfs, or about 59 percent of the routed test flood outflow, just prior to overtopping of the dam.

[1] Corps of Engineers Circular No. 1110-2-27, Aug'66

SECTION 6

STRUCTURAL STABILITY

6.1 Visual Observations

The dam was observed to be in good overall condition. The four-foot thick concrete wall forming the crest of the dam shows no sign of movement and, with the exception of superficial staining at the construction joints, the concrete appears to be in good condition.

The concrete retaining wall along the west side of the spillway is cracked in many locations from the bottom to the top of the spillway (See photo 6, Appendix C). From observations it is not possible to judge how deep the cracks may extend. The largest crack in the vicinity of the top of the wall appears to be about 0.25 inches.

Some concrete spalling was observed along the access walkway over the spillway and on the foundation walls of the gatehouse. Local displacement of stones was observed along the downsteam face of the dam. These conditions are not considered serious.

6.2 Design and Construction Data

According to the Owner's representative, no design or construction data is available.

6.3 Post Construction Changes

The dam was extensively modified in 1927, as discussed in Section 1.2h. Drawings of the modifications are included in Appendix B.

6.4 Seismic Stability

Upper Glen Reservoir Dam is located in seismic zone 2 on the "Seismic Zone Map of Contiguous States". Therefore, according to the Recommended Guidelines for Phase I dam inspections, the dam need not be evaluated for seismic stability.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. From visual inspection, it appears that the dam is in good overall condition. Operation and maintenance procedures are performed as needed and, with the exception of the following items which need attention, are done in a satisfactory manner:

1. Cracking of the west side spillway training wall.

2. Spalling of concrete on the foundation walls of the gatehouse and on the access bridge over the spillway.

3. The crank and the worm gear for the 24-inch diameter low level outlet sluice gate operator are not kept at the site.

b. Adequacy of Information. The visual inspection, along with information furnished by the Town of Greenfield Department of Public Works, proved adequate for a Phase I assessment of Upper Glen (Greenfield) Reservoir Dam.

c. Urgency. The recommendations and remedial measures described in Sections 7.2 and 7.3 should be implemented within two years of receipt of this Phase I Inspection Report.

7.2 Recommendations

The Owner, the Town of Greenfield, should retain the services of a qualified, registered professional engineer, experienced in the design and construction of dams for the following purposes:

1. Perform detailed hydrologic and hydraulic analyses to assess the need for increasing the project discharge capacity and to evaluate the ability of the structure to withstand overtopping.

2. Assess the structural integrity of the west side spillway training wall.

7.3 Remedial Measures

The Owner, the Town of Greenfield should also implement the following operation and maintenance procedures:

1. Operate and repair, if needed, the 24-inch diameter low level sluice gate and the 12-inch diameter drain valve to verify their reliable operation.

2. Develop and implement an operation and maintenance program.

3. Institute an annual technical inspection.

4. Repair the spalled concrete on the foundation walls of the gatehouse and on the access bridge over the spillway.

5. Develop a formal downstream warning system.

7.4 Alternatives

No valid alternatives to the recommendations and remedial measures described above are considered feasible for this site.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST

INSPECTION TEAM ORGANIZATION

Project: Upper Glen Reservoir Dam

National I.D.#: MA 00049

Location: Leyden, Massachusetts

Type of Dam: Stone Masonry and Rock Fill

Inspection Date(s): December 3, 1980

Weather: Overcast, 40's

Pool Elevation: 526.2± MSL

Inspection Team

Lee DeHeer	O'Brien & Gere	Managing Engineer
Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Denis Mehu	Bryant & Associates	Hydrology/Hydraulics

Owner's Representative

Mr. James Cook, Town Engineer; Town of Greenfield, Massachusetts; 01301.

(413/772-0166)

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir Dam

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT Rock Fill	
Crest Elevation	533.0 (see sheet 3)
Current Pool Elevation	526.0
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	OK
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Appears to be good
Horizontal Alignment	Appears to be good
Condition at Abutment and at Concrete Structures	Sound, no deficiencies observed
Indications of Movements of Structural Items on Slopes	None Observed
Trespassing on Slopes	None Observed
Vegetation on Slopes	Grass at top of slope (Rock Fill on slope)
Sloughing or Erosion of Slopes or Abutments	Minor Displacement of Rocks on Slope
Rock Slope Protection - Riprap Failures	Upstream face is finished with gunite (recently repaired)

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir Dam

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT (Con't)	
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or Downstream Seepage	None Observed
Piping or Boils	None Observed
Foundation Drainage Features	Rock Fill drainage ditch
Toe Drains	Rock Fill drainage ditch
Instrumentation System	None

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir Dam

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
CONCRETE/MASONRY DAM	
Crest Elevation	533.0
Current Pool Elevation	526.0
Maximum Impoundment to Date	Unknown
Any Noticeable Seepage	None Observed
Conditions of Abutment	Sound, no deficiencies observed
Drains	Blowoff & low level outlet
Water Passages	Connection to 30" water supply
Foundation	Suspected to be rock
Masonry/Concrete Surface Cracks	Several at spillway training walls (See photo 5, Appendix C)
Structural Cracking	Superficial cracking only
Vertical and Horizontal Alignment	Appears to be good
Monolith Joints	Not applicable
Construction Joints	Observed along dam well - OK
Upstream Embankment	Vertical Masonry Wall
Instrumentation System	None
Inspection Galleries	None

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir Dam

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Reservoir Pool
General Condition	Clear
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Unknown
b. Weir and Training Walls	
General Condition of Concrete	Poor
Rust or Staining	None Observed
Spalling	Minor spalling at Access Bridge
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Drain Holes	None observed
c. Discharge Channel	
General Condition	Clear, good slope

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir Dam

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS (Con't)	
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Several (see photo 6, Appendix C)
Floor of Channel	Weathered rock
Other Obstructions	Insignificant

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir Dam

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Poor Condition at Foundation
Condition of Joints	Some mortar missing from between bricks
Spalling	Much spalling at foundation
Visible Reinforcing	None observed
Rusting or Staining of Concrete	None observed
Any Seepage or Efflorescense	None observed
Joint Alignment	Appears to be good
Unusual Seepage or Leaks in Gate Chamber	None observed
Cracks	Superficial cracking on concrete
Rusting or Corrosion of Steel	None observed
b. Mechanical and Electrical	
Air Vents	None
Float Wells	None
Crane Hoist	Manual gate hoists in good condition new circa 1975

VISUAL INSPECTION CHECK LIST

Project: Upper Glen Reservoir DAm

National I.D. #: MA 00049

Date(s): December 3, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER (Con't)	
Elevator	None
Hydraulic System	None
Service Gates	New circa 1975
Emergency Gates	Believed to be operable but may be blocked with silt
Lighting Protection System	Not applicable
Emergency Power System	None
Wiring and Lighting System in Gate Chamber	Not applicable

APPENDIX B

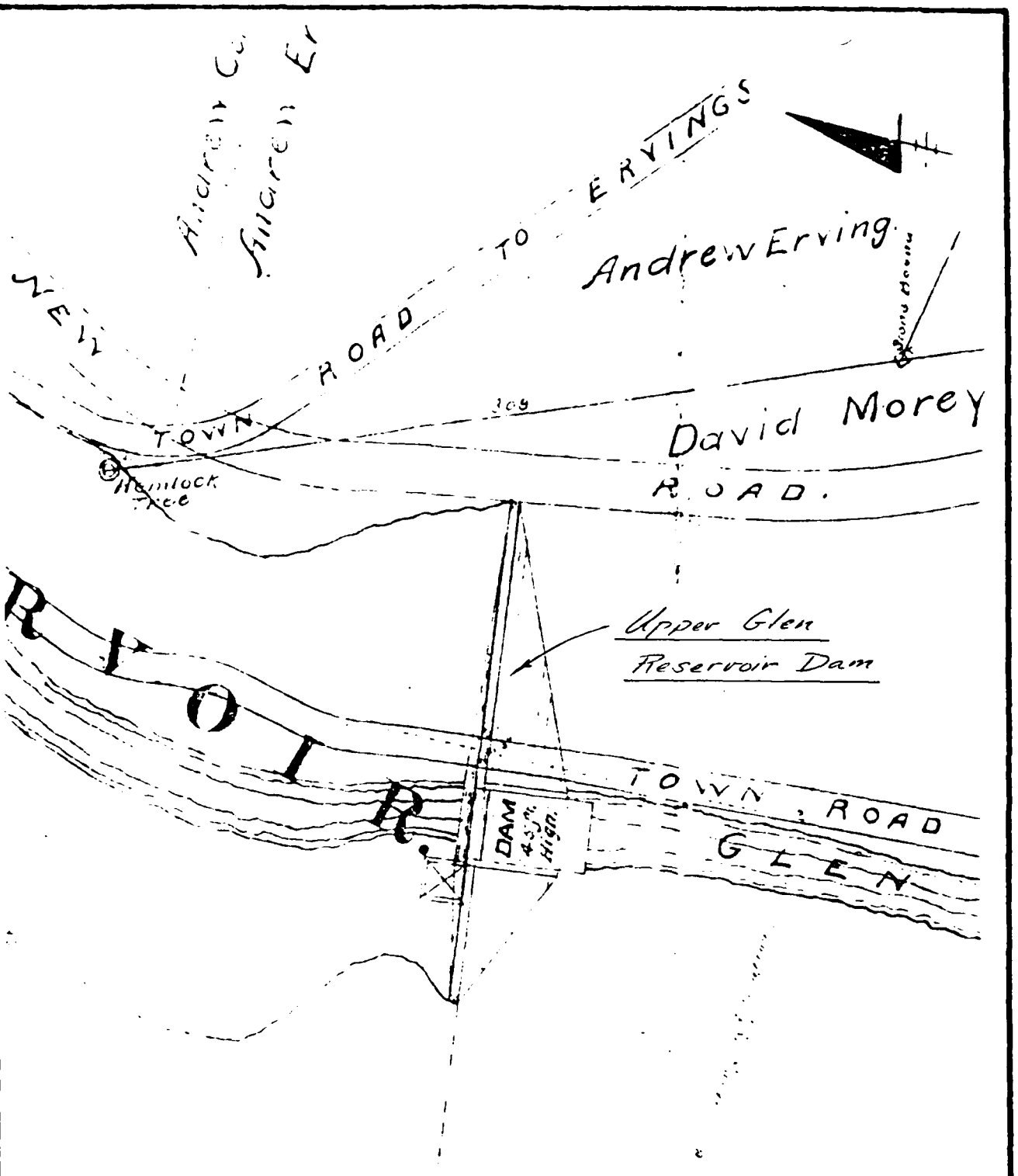
ENGINEERING DATA

APPENDIX B

ENGINEERING DATA*

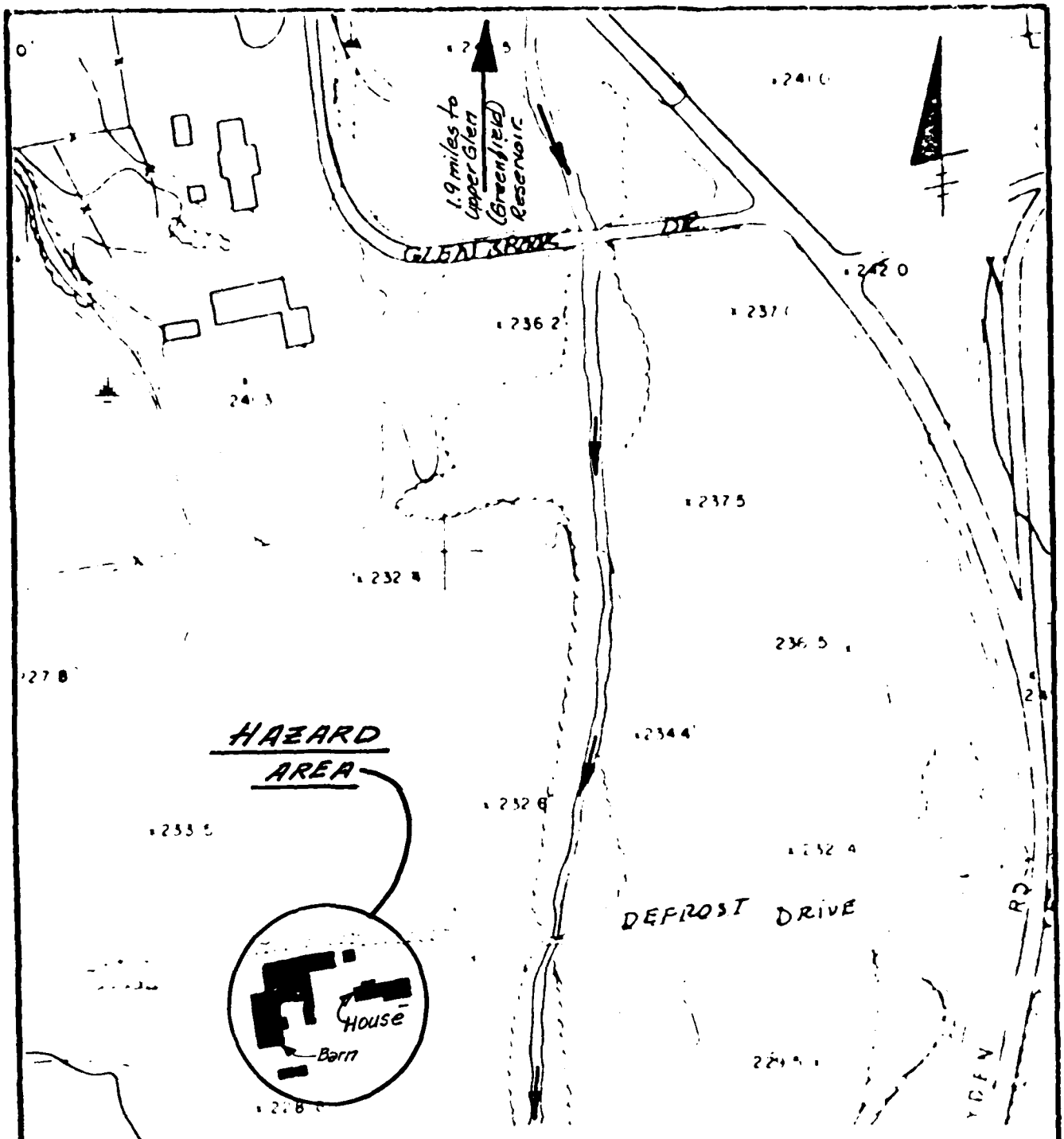
TABLE OF CONTENTS

*Information included in this Appendix has been reproduced from drawings furnished by the Town of Greenfield Department of Public Works - Water Division.



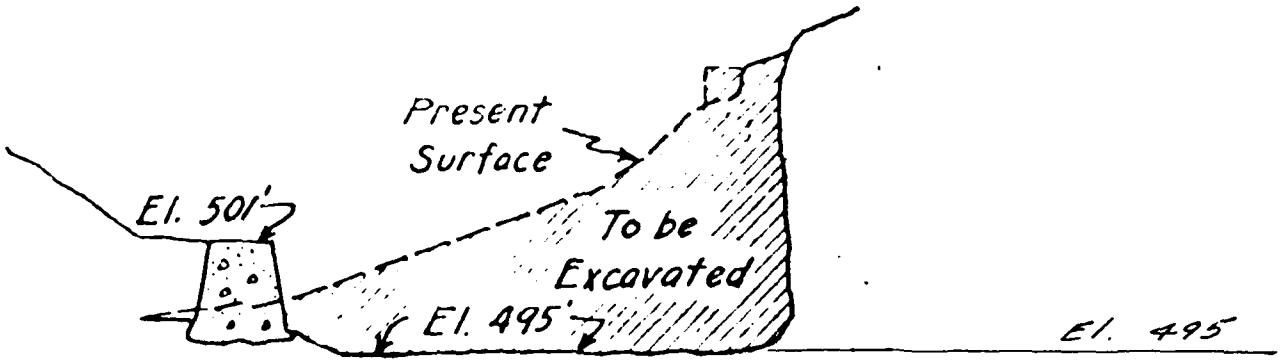
NOTE: This drawing was taken from a March, 1904 Plan furnished by the Town of Greenfield. (Signed by Chas. J. Day, Eng.)

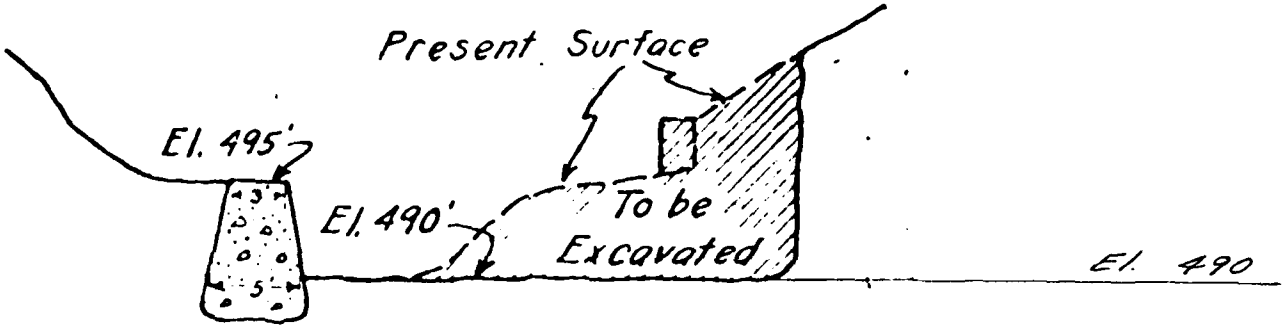
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
CONTRACT NO. DACW 33-81-C-0016 UPPER GLEN RESERVOIR DAM		
PLAN OF ORIGINAL DAM		
O'BRIEN & GERE	Date: Jan.,1981 Scale: 1"=60'	B-1

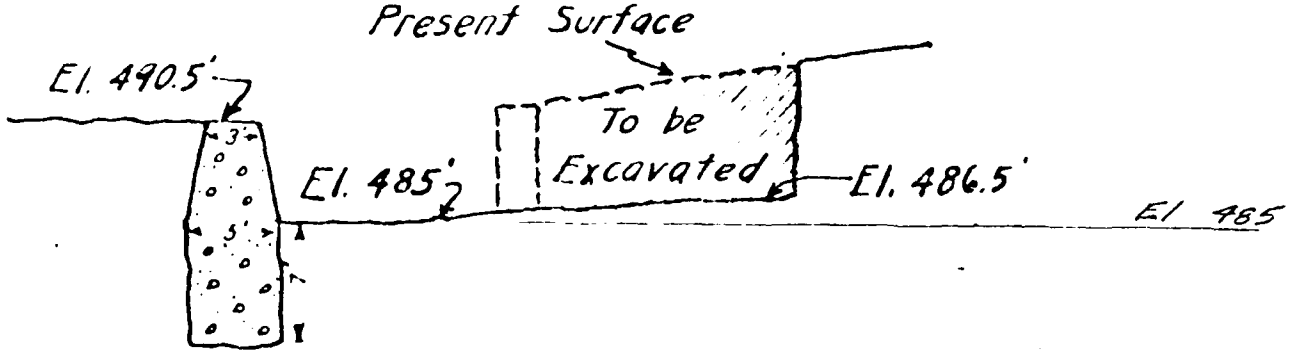


Note: This drawing was reproduced from Town of Greenfield Flood Insurance Map 5-E, photo date April 19, 1970.

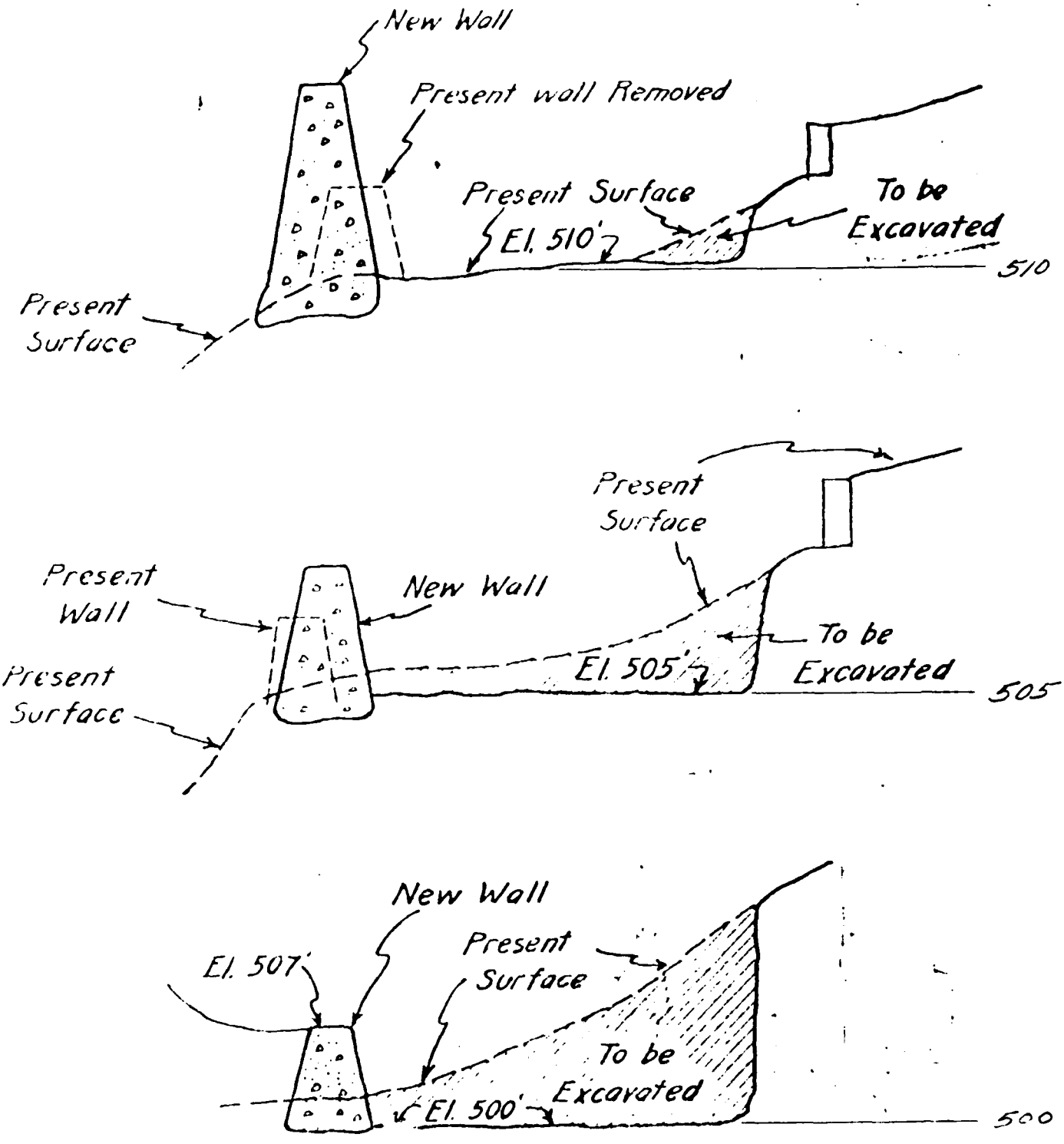
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
CONTRACT NO. DACW 33-81-C-0016 UPPER GLEN RESERVOIR DAM		
MAP OF HAZARD AREA		
OBRIEN & GERE	Date: Jan.,1981 Scale: 1"=200'	B-2



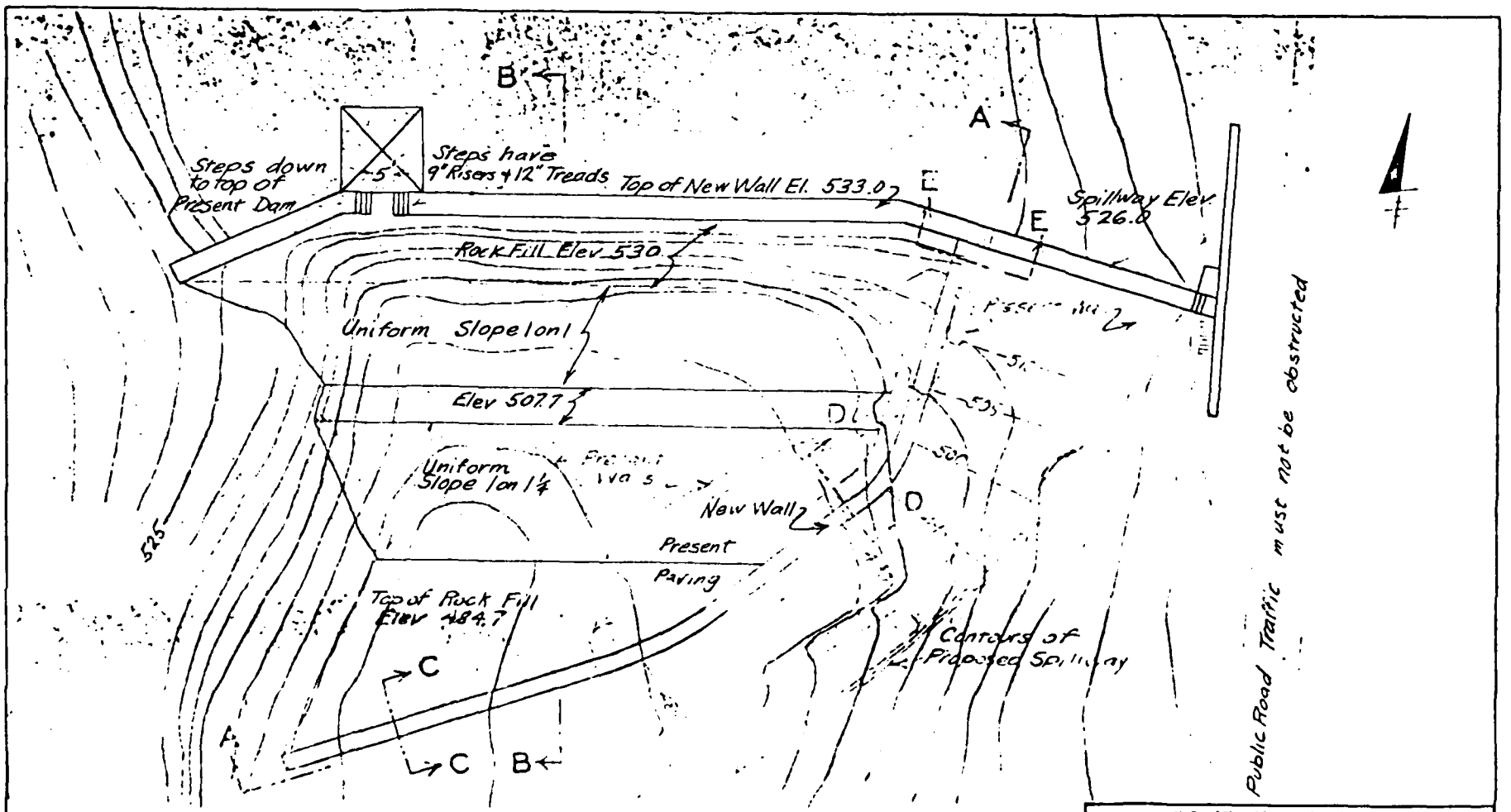




Note: These sections have been reproduced from a Greenfield Water Works Drawing entitled "Upper Reservoir Dam - Original Section 3 and New Spillway". (Approx. date - 1927)



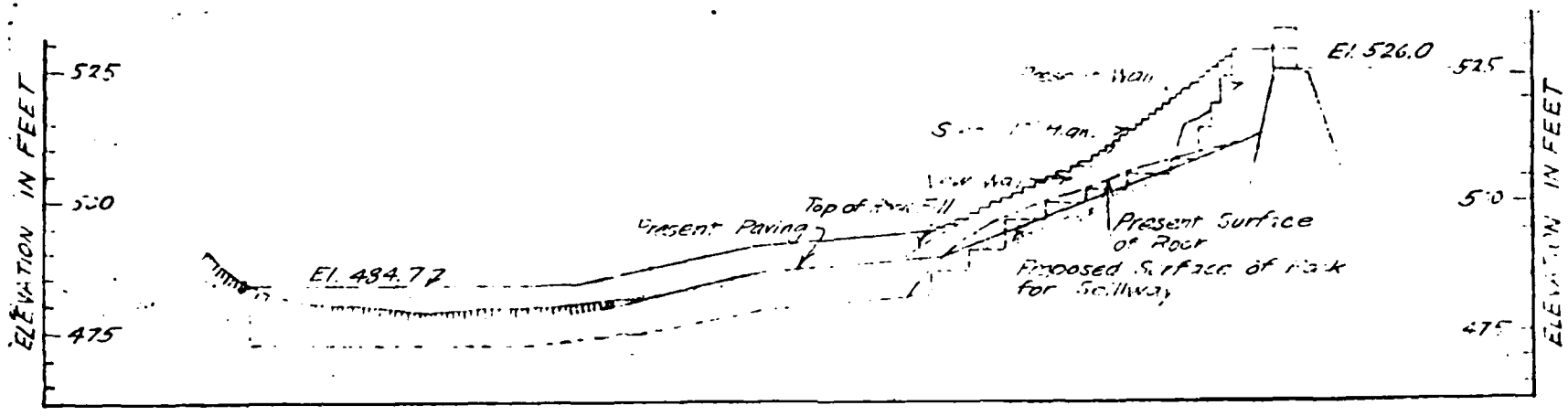
Note: These sections have been reproduced from a Greenfield Water Works Drawing entitled "Upper Reservoir Dam - Original Section 3 and New Spillway". (Approx. date - 1927)



PLAN
SCALE 1"=20'

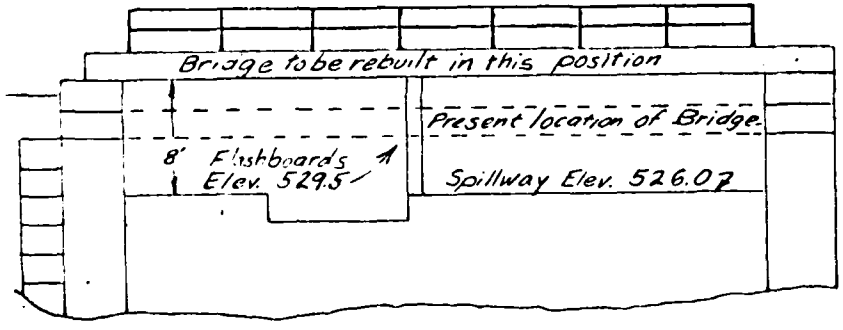
NOTE: This plan has been reproduced from an April 6, 1927 Drawing entitled "Repairs To Upper Reservoir Dam". Sections also shown on that Drawing are included on pages B-6 through B-9.

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION
CONTRACT NO. DACW 33-81-C-0016 UPPER GLEN RESERVOIR DAM
PLAN OF 1927 DAM MODIFICATIONS
O'BRIEN & GERE — Date: Jan., 1981 Scale: 1"=20' — B-5



SECTION A-A

SCALE 1" = 20'

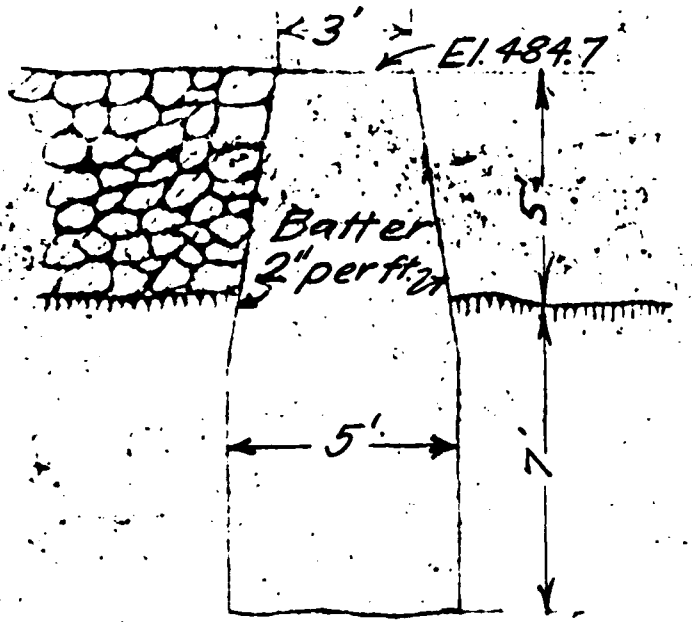


ELEVATION OF SPILLWAY

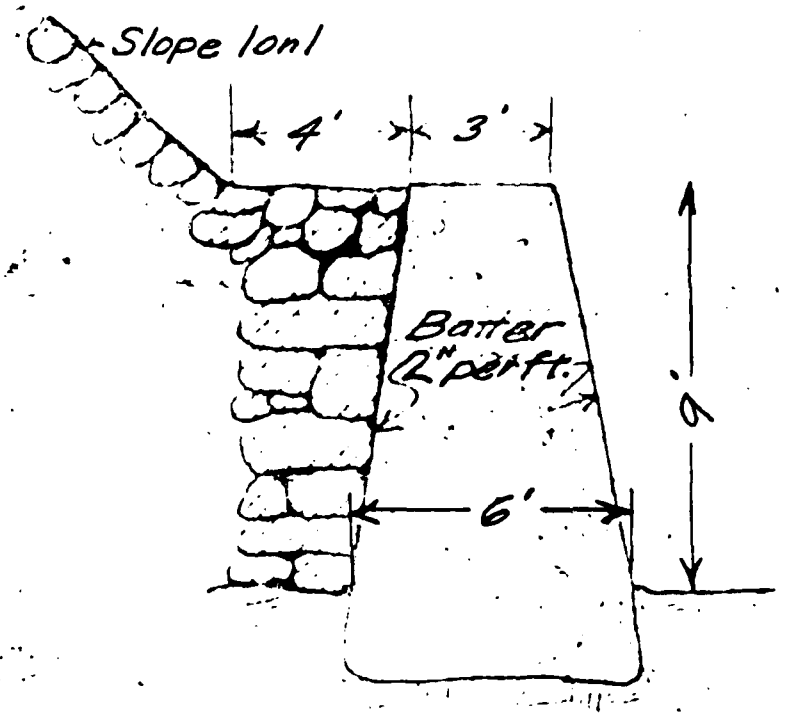
SCALE 1"=8'

NOTE: These drawings are referenced from the plan shown on page 8-5 of this Appendix.

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
CONTRACT NO. DACW 33-81-C-0016 UPPER GLEN RESERVOIR DAM		
SECTION A ELEVATION OF SPILLWAY MODS.		
DONIEN&DERR	Date: Jan.,1981 Scale: As shown	8-6

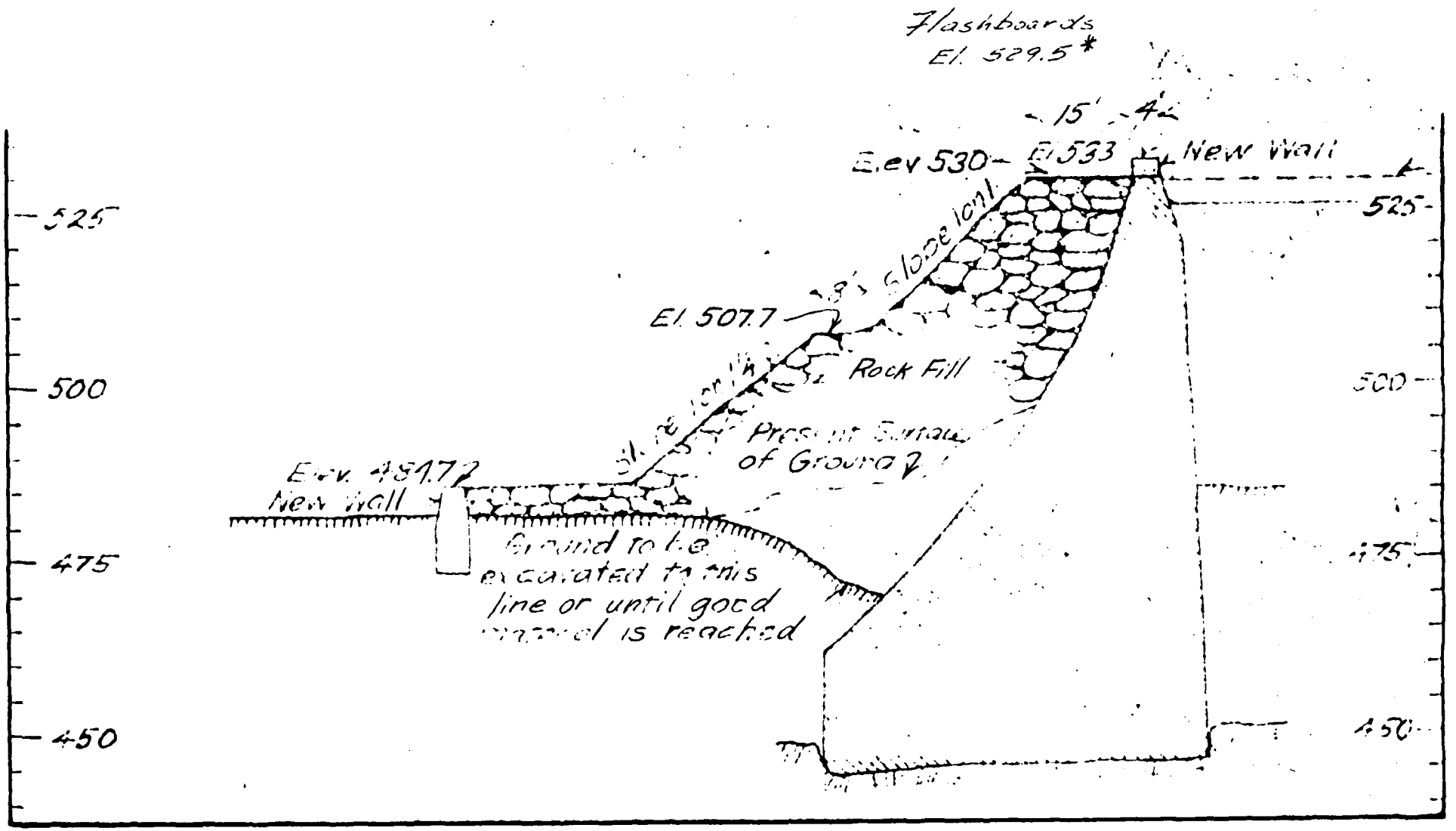


SECTION C-C
SCALE 1"=4'



SECTION D-D
SCALE 1"=4'

NOTE: These Sections are referenced from the plan shown on page B-5 of this Appendix.

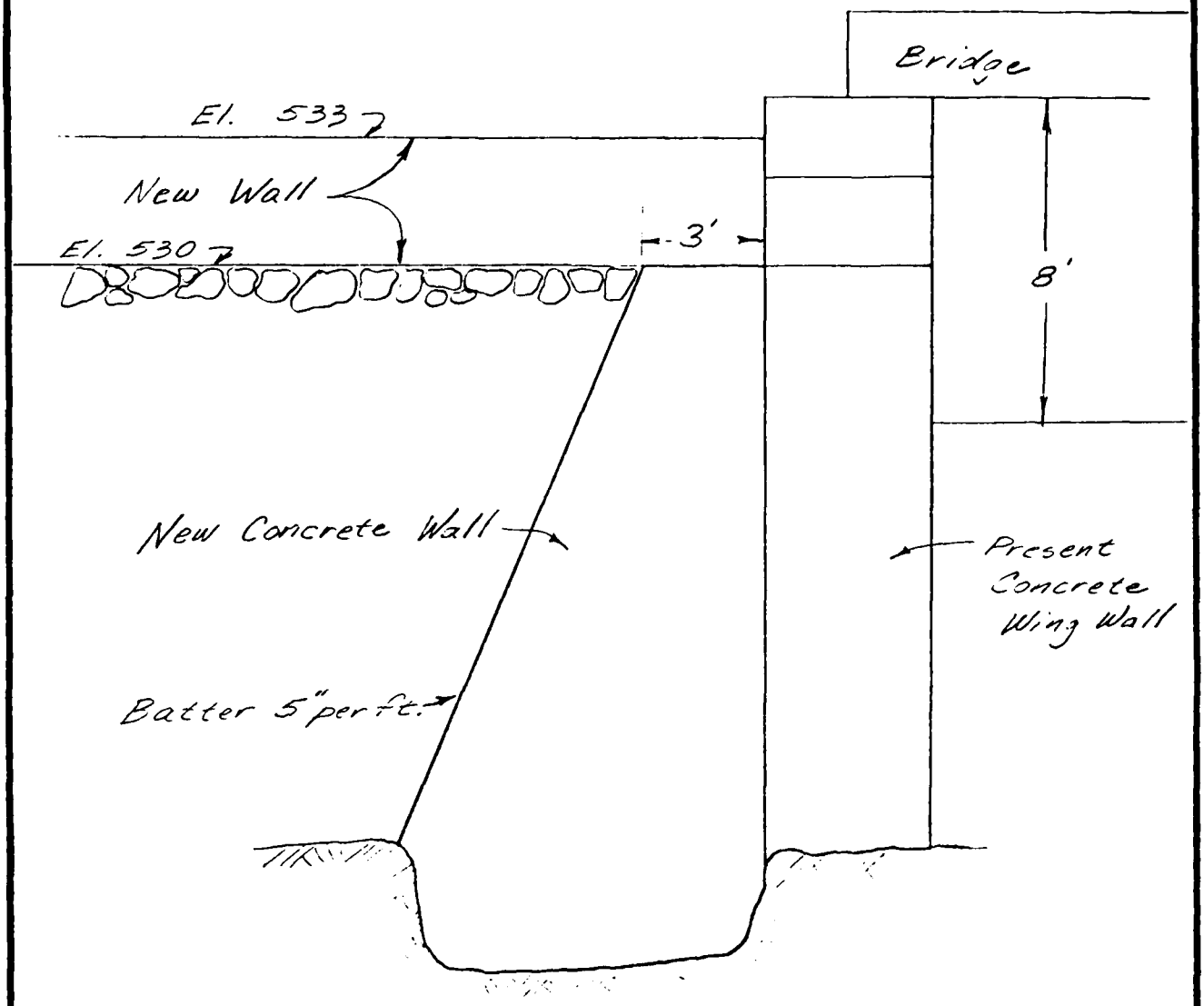


SECTION B-B

SCALE 1" = 20'

*No longer used.

NOTE: This Section refers to the plan shown on page B-5 of this Appendix.



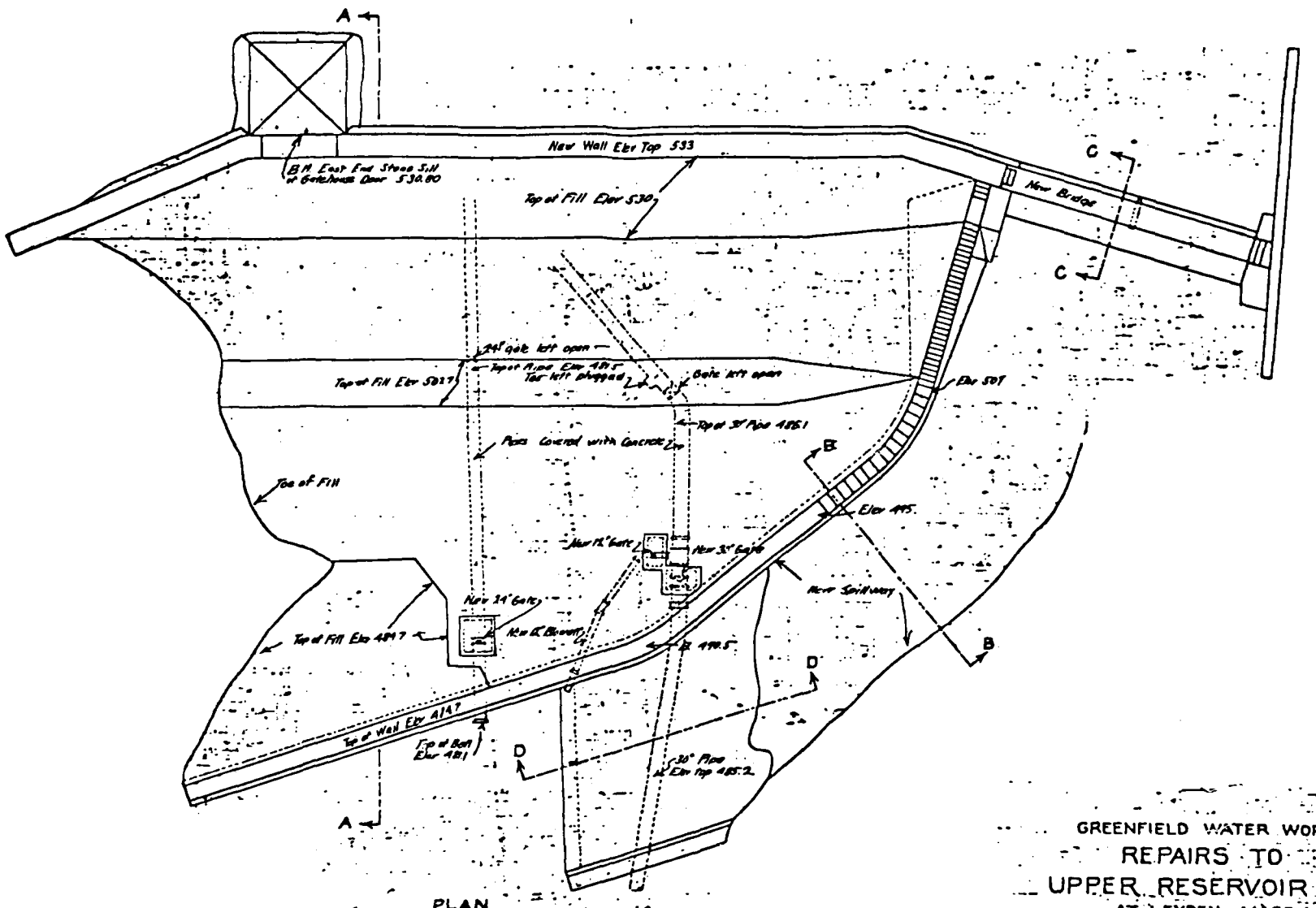
SECTION E-E

SCALE 1" = 4'

NOTE: This Section is referenced from the plan shown on page B- of this Appendix.

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION
CONTRACT NO. DACW 33-81-C-0016 UPPER GLEN RESERVOIR DAM
SECTION OF SPILLWAY RETAINING WALL

O'BRIEN & GERE	Date: Jan., 1981 Scale: 1"=4'	B-9



GREENFIELD WATER WORKS

REPAIRS TO

UPPER RESERVOIR DAM

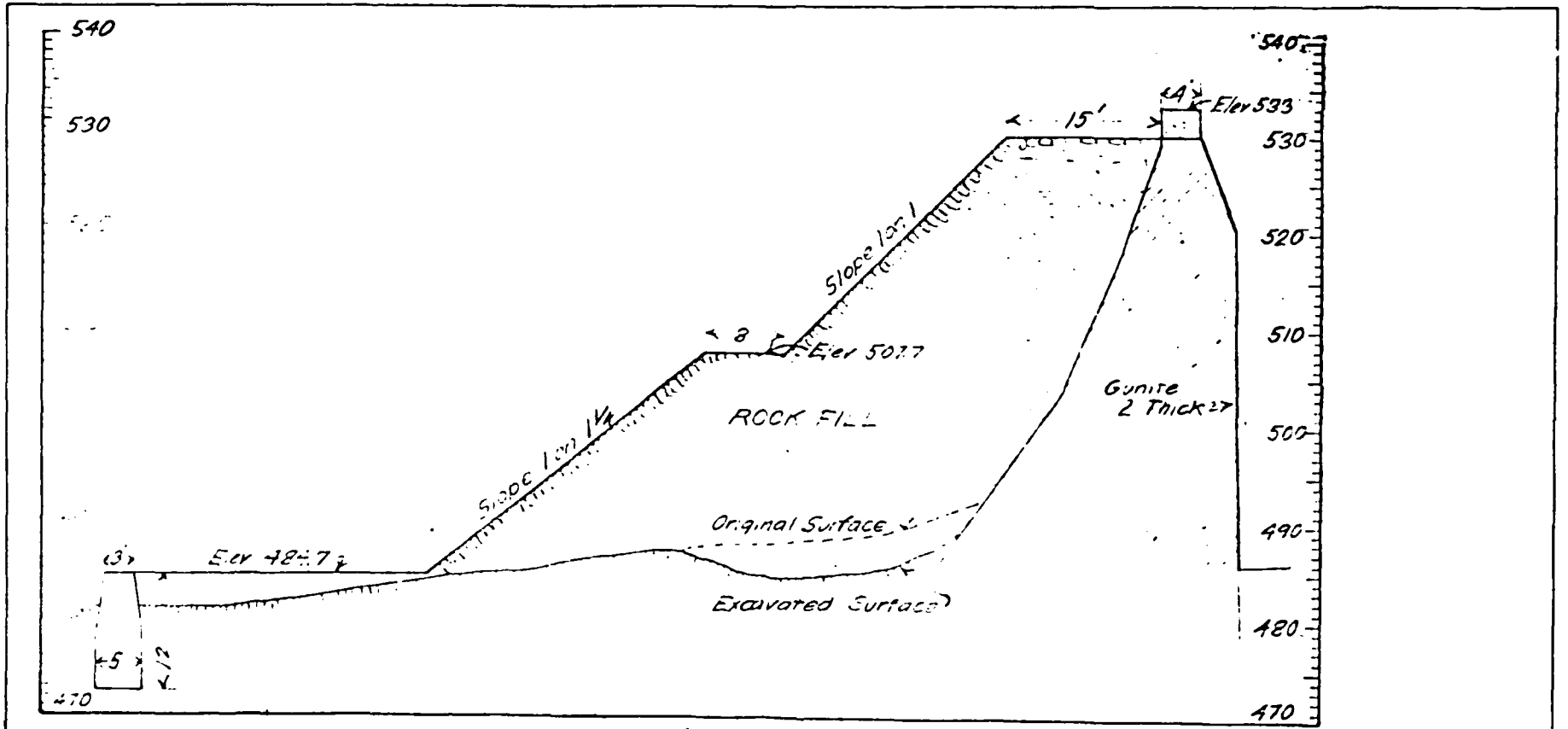
AT LEYDEN, MASS

RECORD PLAN

Scale 1" = 10'

Hazen & Whipple
Civil Engineers
11 West 39th St. NY. City
Sept. 29, 1927

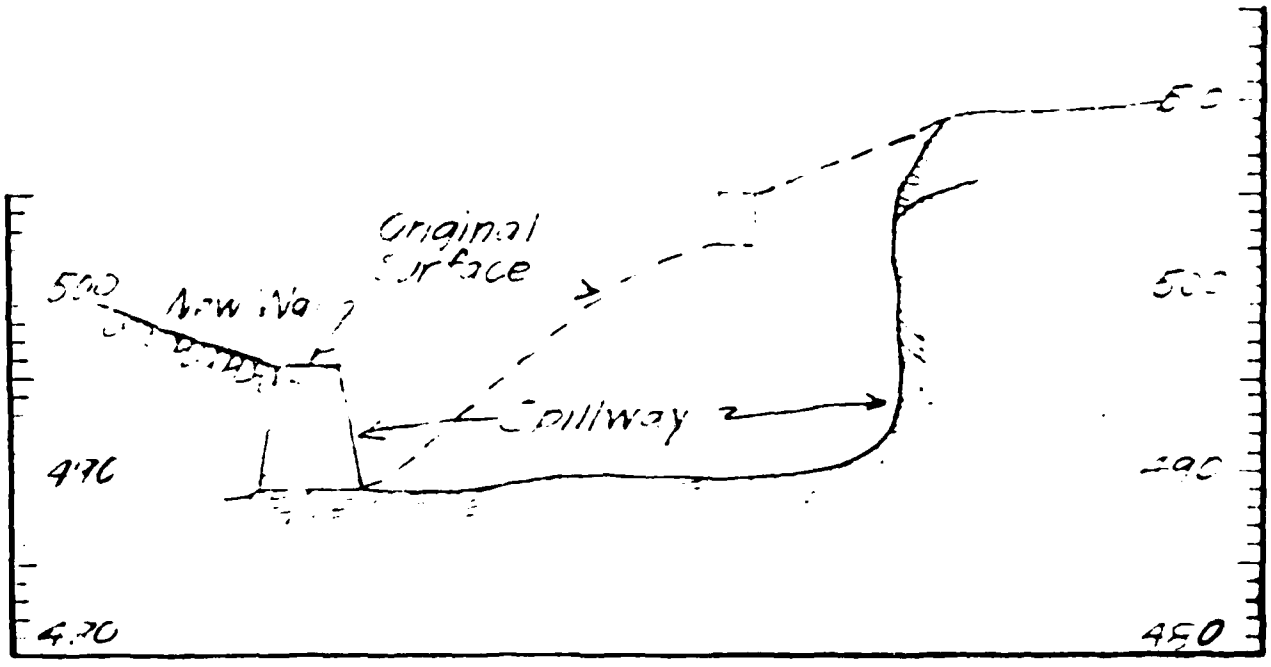
B-10



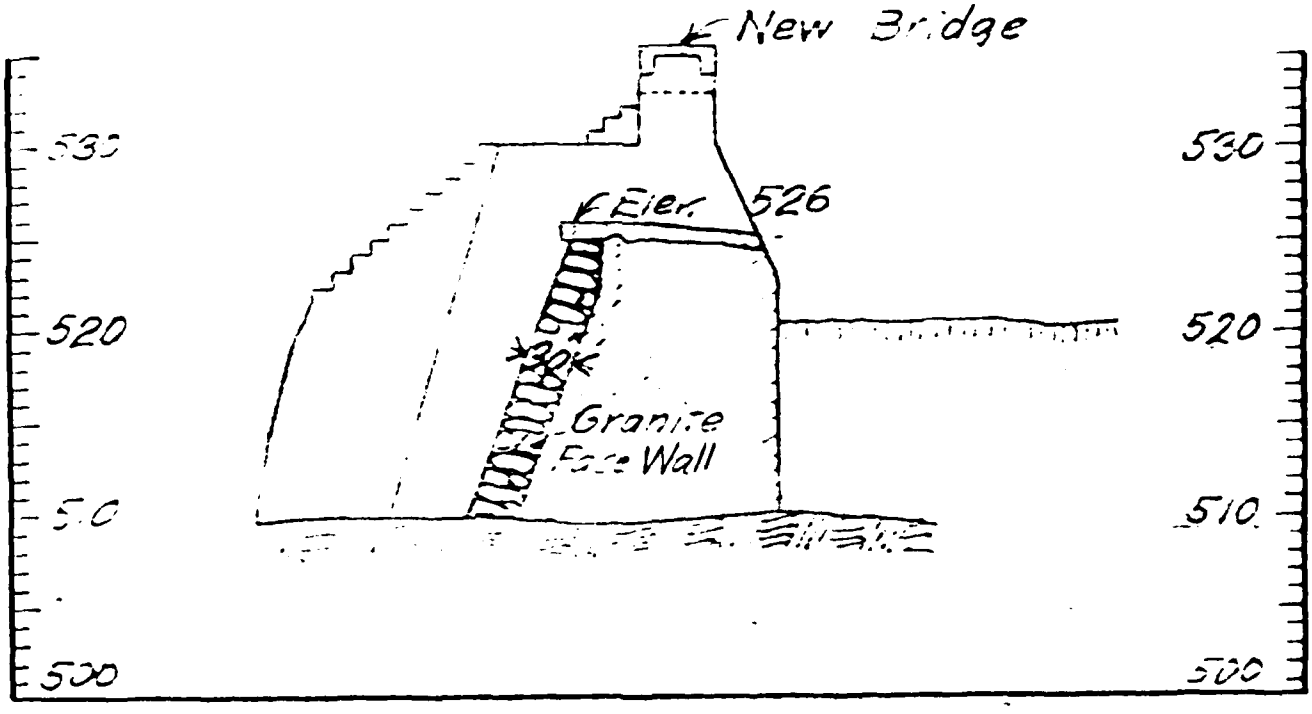
SECTION A-A

NOTE: This Section refers to the plan shown on page B-10 of this Appendix.

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
CONTRACT NO. DACW 33-81-C-0016 UPPER GLEN RESERVOIR DAM		
SECTION OF DAM EMBANKMENT		
O'BRIEN & GERE	Date: Jan., 1981 Scale: 1"=10'	B-11

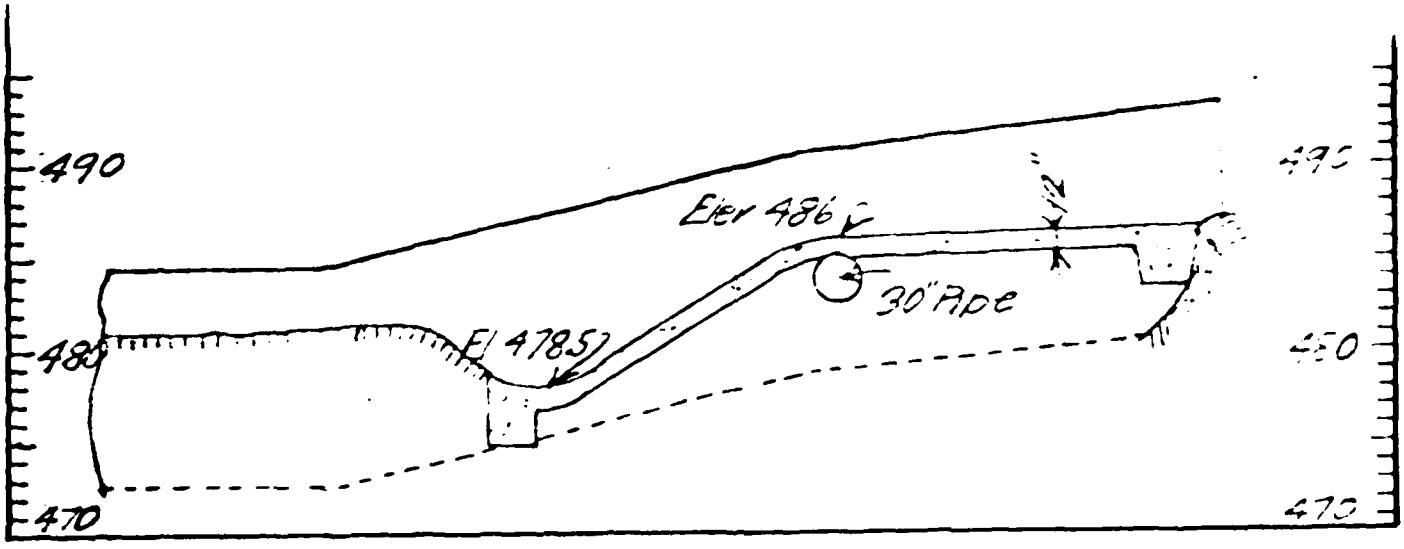


SECTION B-B



SECTION C-C

Note: These sections refer to the plan shown on page B-10 of this Appendix.



SECTION D-D

Note:

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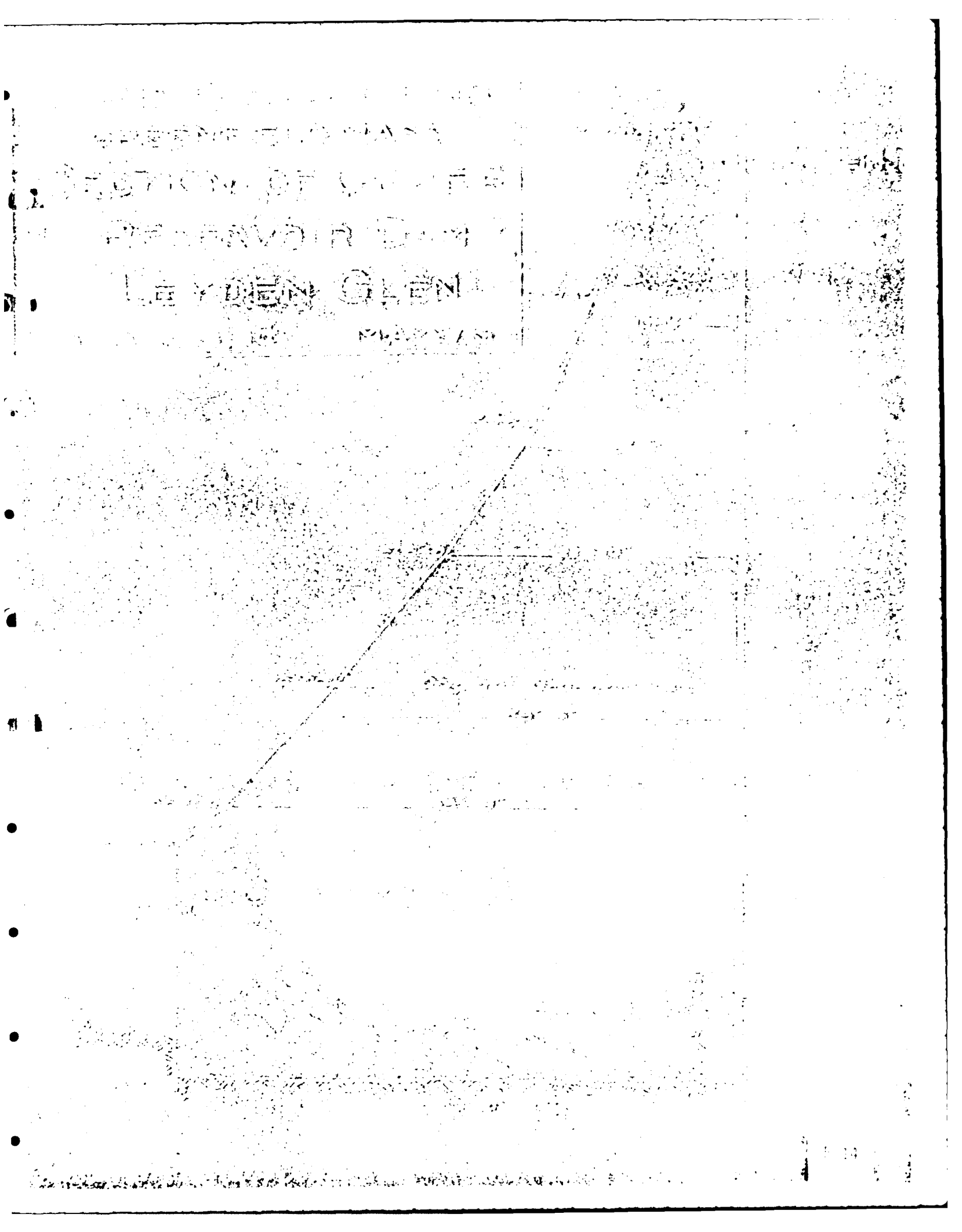
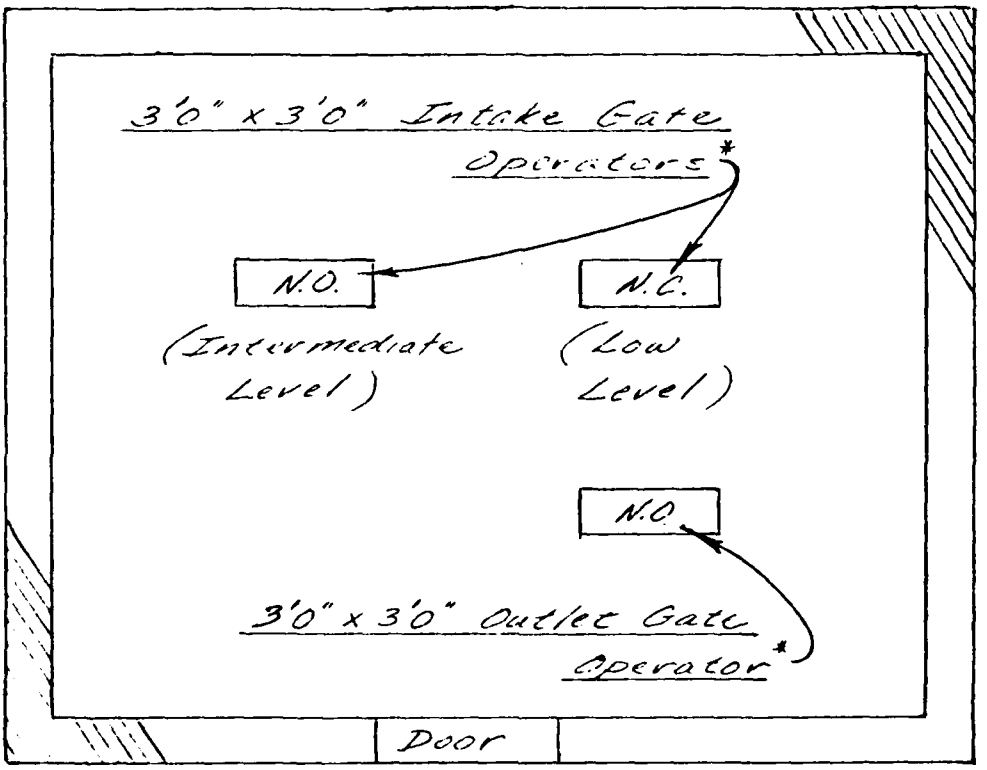


O'BRIEN & GERE ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	1/1	ADH	1/06/81	2060.002

Reservoir Pool



SKETCH : FIRST FLOOR PLAN OF GATEHOUSE

(Not to Scale)

N.O. - Normally Open
N.C. - Normally Closed

* New gates & operators were installed in 1975.

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

January 19, 1978

Greenfield Dept. of Public Works
Water Division
Town Offices - Court Square
Greenfield, MA
Attention: Mr. J. P. Mosseau

re: Inspection Dam No. 2-6-156-3
Upper Reservoir Dam
Leyden

Gentlemen:

On June 21, 1977, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be Town of Greenfield. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 705 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

Brush growth on top and on downstream slope of dam should be removed. Gate house walls have deteriorated more and vertical crack in the easterly wall appears to have shifted out of alignment approximately one inch.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

John J. Hannon, P.E.
Chief Engineer

AHc:j

cc: Mr. Hoey, DHE, District 2
H. Shumway, District 2

B-16

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/Town Leyden. County Franklin. Dam No. 2-6-156-3

Name of Dam Upper Reservoir.

Topo Sheet No. 10 B. Coordinates: Mass. Rect. N 607,300, E 299,600.

Inspected by: Harold T. Shumway, On June 21, 1977. Date Last Inspection 6-11-75

2. OWNER/S: As of June 21, 1977

per: Assessors_____, Reg. of Deeds_____, Prev. Insp. X, Per. Contact X.

	Name	St. & No.	City/Town	State	Tel. No.
1.	Town of Greenfield, Dept. of Public Works, Water Division	Town Offices, Court Square	Greenfield,	Mass.	
2.					
3.					

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.
Mr. J. P. Mosseau Supt., D.P.W.,	Town Offices, Court Square,	Greenfield,	Mass.	

4. DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where Greenfield Town Engineer's Office files.

5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor_____.
2. Moderate X.
3. Severe_____.
4. Disastrous_____.

Comments: Would over top Lower Reservoir Dam No. 2-6-156-2, considerable farm land would be affected.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: East end of dam-45'W.X8'H. crest overflow spillway with over hanging crest and a straight dropwall.

Controls Yes __, TYPE: Provisions for flash boards on crest of spillway.

Automatic____. Manual X___. Operative Yes___, No X___.

Comments: Flash boards no longer used-slight minor spalling of crest cap-dropwall alignment appears good.

No. 2 Location and Type: Westerly end of dam-24" diameter C.I. pipe drawdown conduit.

Controls Yes ___, Type: Screw lift gate on upstream end-24" diameter gate valve on down stream end.

Automatic_____. Manual X___. Operative Yes X___, No_____.

Comments: Controls in good working order per Town Engineer.

No. 3 Location and Type: West end of dam-gate house with a 30" diameter C.I. water supply intake pipe.

Controls Yes ___, Type: Intake gate valves in gate house-M.H. with a 30"diam gate valve at downstream end-12" diam. blow-off pipe at toe of slope.

Automatic_____. Manual X___. Operative Yes X___, No_____.

Comments: Also sluice gates in gate house. All controls in good condition

Drawdown present Yes X___, No_____. Operative Yes X___, No_____.

Comments: See item #2 above.

(7.) DAM UPSTREAM FACE: Slope 1:10 for 10 feet then vertical. Depth Water at Dam 50'±.

Material: Turf_____. Brush & Trees_____. Rock Fill_____ Concrete Masonry X .Wood__

Other New Gunite surface over concrete masonry.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs___X___. 4. Urgent Repairs_____.

Comments: Condition of gate house walls same as found on last inspection off-11-vertical crack in east wall is out of alignment by 1 inch±. Minor surface cracks noted in gunite facing of main dam wall.

(8.) DAM DOWNSTREAM FACE: Slope 1:1 for 20' then 8' wide berm to 1:1½ slope for 23'.

Material: Turf X___. Brush & Trees____. Rock Fill X___. Concrete Masonry X . Wood____

Other Turfed top-stone paved rockfill slope-concrete toe wall.

Condition: 1. Good_____. 3. Major Repairs_____

2. Minor Repairs X . 4. Urgent Repairs_____

B-18

Comments: Minor brush growth on top of dam and downstream slope. Toe dropwall of spillway chute is badly spalled. Chute floor above dropwall has

(9.) EMERGENCY SPILLWAY: Available Yes . Needed ____.

Height Above Normal Water 7 Ft. plus

Width 210' ± Ft. Height unlimited Ft. Material concrete-rockfill .

Condition: 1. Good ____. 3. Major Repairs ____.

2. Minor Repairs ____. 4. Urgent Repairs ____.

Comments: Entire top of dam could be overflow spillway but present spillway appears more than adequate-no record of dam ever being over topped since constructed in 1904.

(10) WATER LEVEL AT TIME OF INSPECTION: 1/12 Ft. Above X . Below ____.

Top Dam ____ F.L. Principal Spillway X .

Other ____.

Normal Freeboard 7 Ft. When reservoir is full to normal capacity of 45± million gallons-at point of overtopping capacity would be increased to 66 million gallons±.

(11) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Minor brush growth on top and downstream slope of dam-6" to 10" trees at toe between toe of slope and concrete toe wall.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam Minor brush growth along top of dam.

Cracked or Damaged Masonry See item #6, #7, and #8.

Evidence of Seepage None found.

Evidence of Piping None found.

Leaks None found.

Erosion None found.

Trash and/or Debris Impeding Flow None found.

Clogged or Blocked Spillway None found.

Other ____

12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

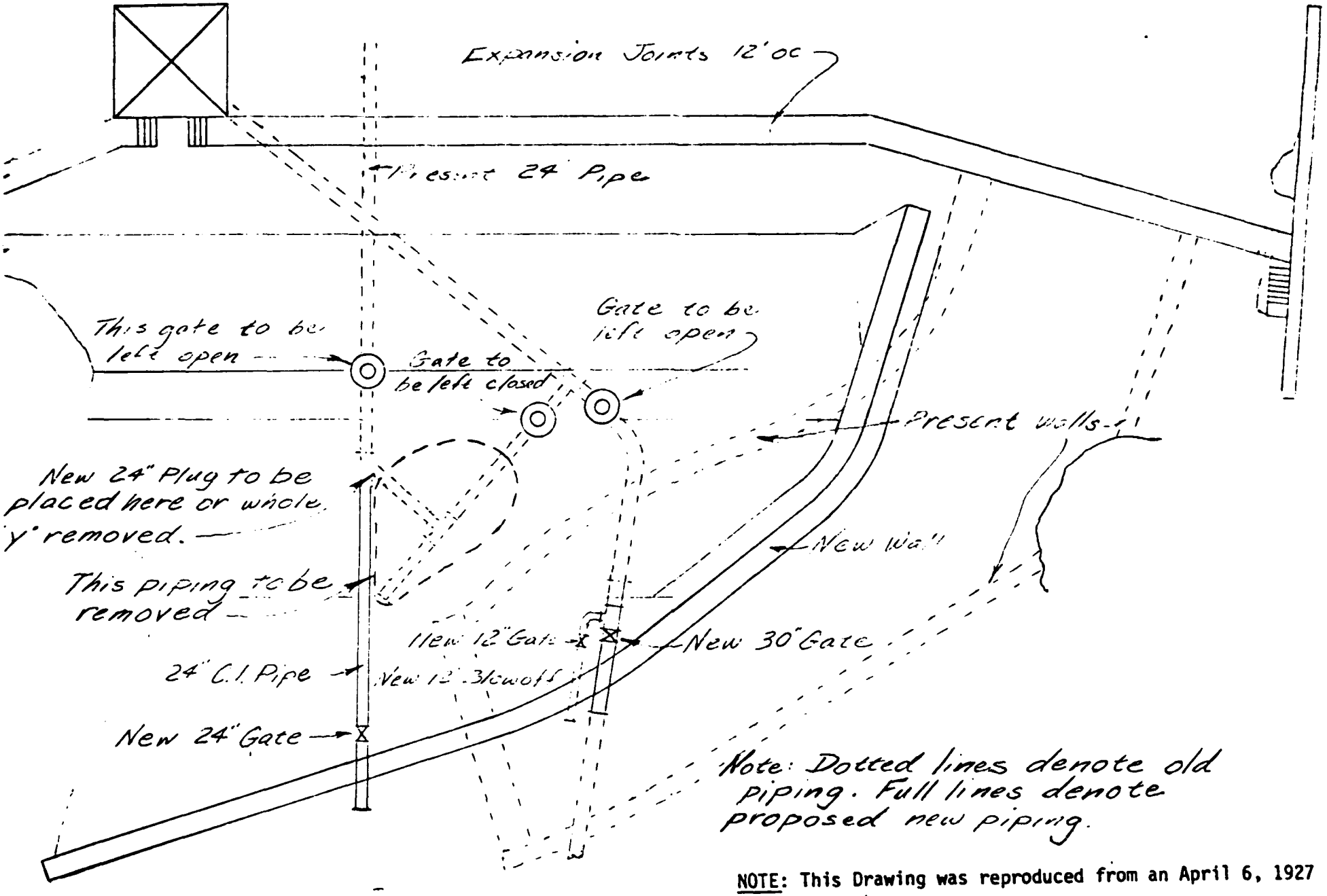
   Recommend removal from inspection list_____.

13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

Mr. James Cook, Greenfield Town Engineer, was present during this inspection. A considerable amount of repair work has been accomplished since last inspection of June 11, 1975. The spillway structure has been gone over and all cracks and spalled areas were repaired. The upstream face of dam wall was repaired and a new gunite facing put on from spillway westerly to a point about opposite the draw down controls. The spillway chute floor near toe drop wall has been repaired. The toe dropwall itself is still badly spalled. A minor brush growth was noted on top and down stream slope of dam which Mr. Cook stated would be cut this season. The gate house walls have deteriorated more and the vertical crack in the easterly wall appears to have shifted out of alignment approximately one inch. This could apply only to the gunite coating or possible the wall itself has cracked. It was not possible to determine the extent or depth of crack into wall by visual inspection only. Several minor surface cracks were noted in gunite facing on main dam wall west of gate house.

While there were several needed routine repairs noted, the dam appears to be basically sound and safe at time of present inspection.

HTS/at

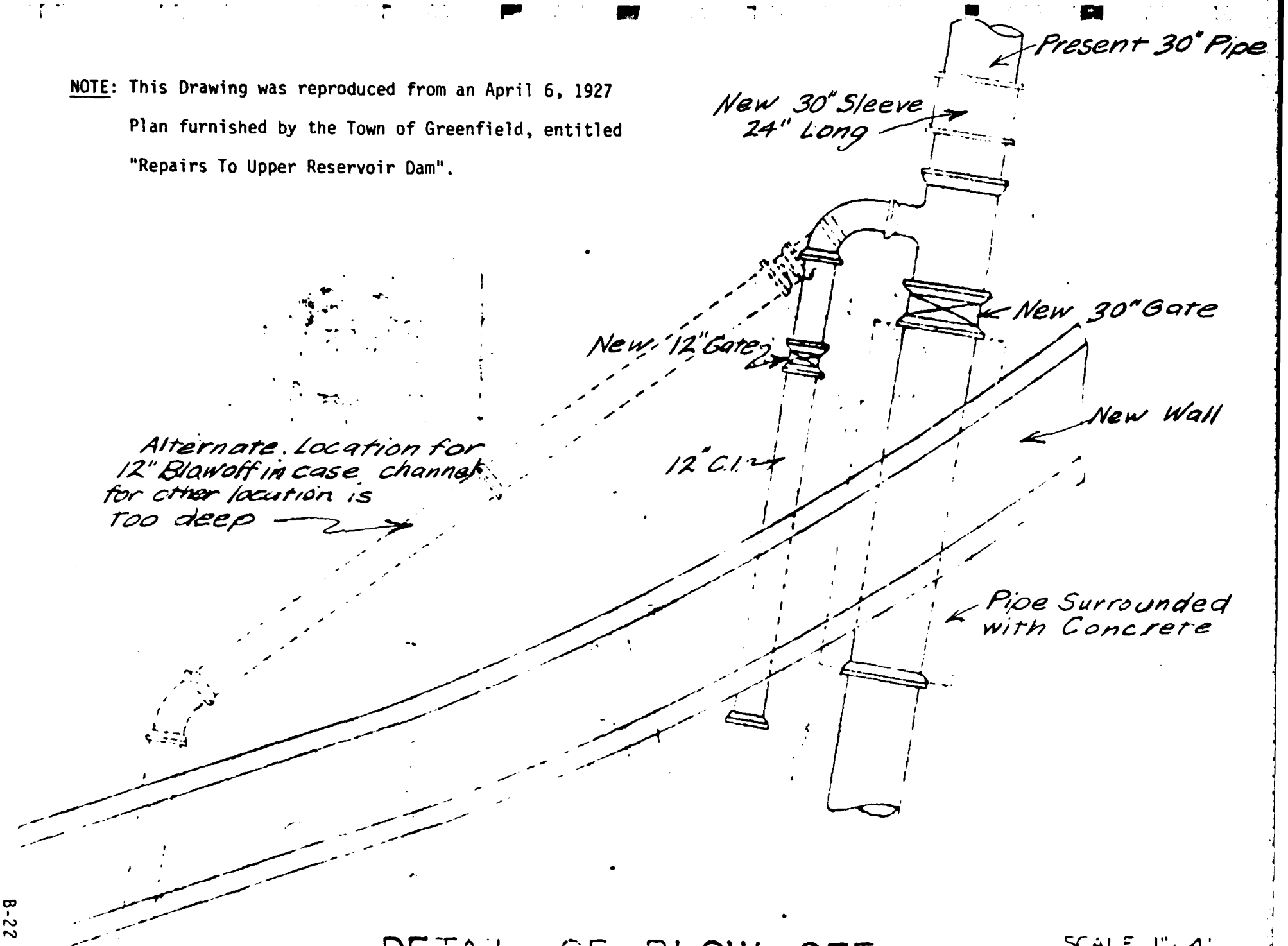


PLAN OF PIPING

SCALE 1" = 20'

NOTE: This Drawing was reproduced from an April 6, 1927 Plan furnished by the Town of Greenfield, entitled "Repairs To Upper Reservoir Dam".

NOTE: This Drawing was reproduced from an April 6, 1927 Plan furnished by the Town of Greenfield, entitled "Repairs To Upper Reservoir Dam".



DETAIL OF BLOW OFF

SCALE 1" = 4'

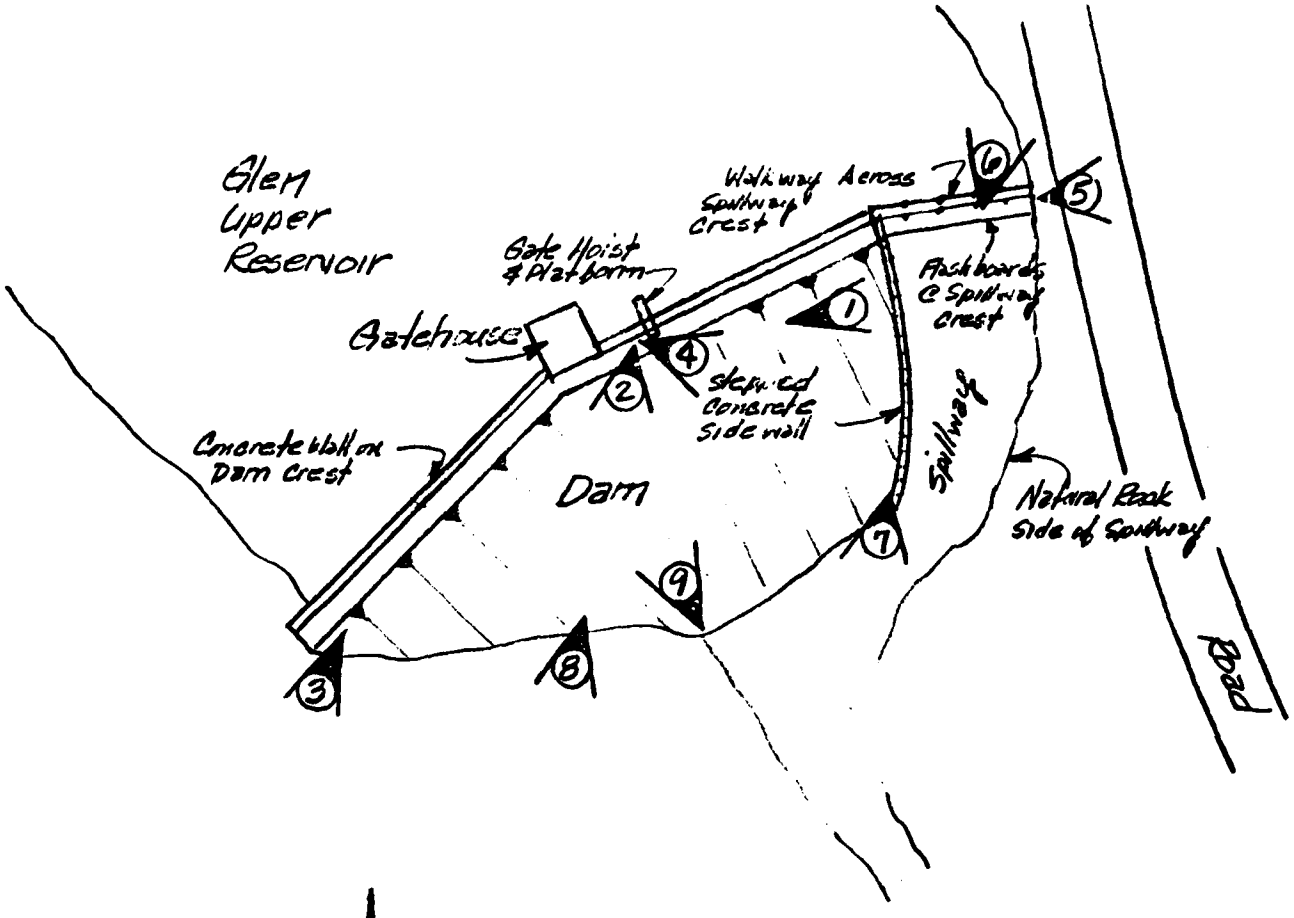
APPENDIX C

PHOTOGRAPHS

APPENDIX C
SELECTED PHOTOGRAPHS OF THE PROJECT

O'BRIEN & GERE
ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
Glen Upper Reservoir Dam	A			

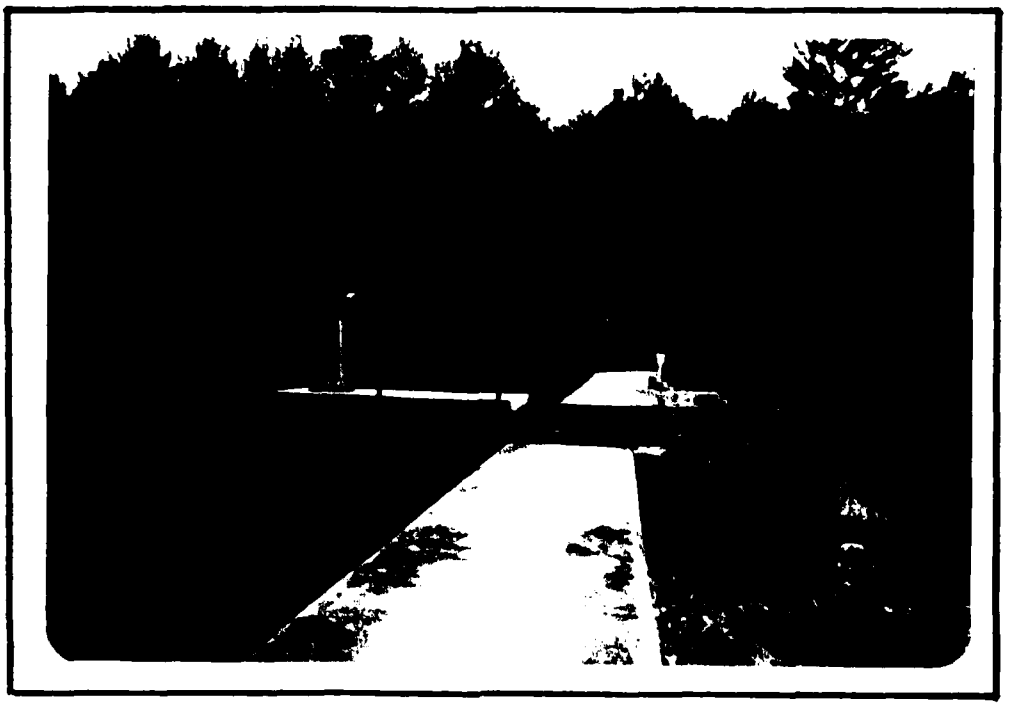


LEGEND

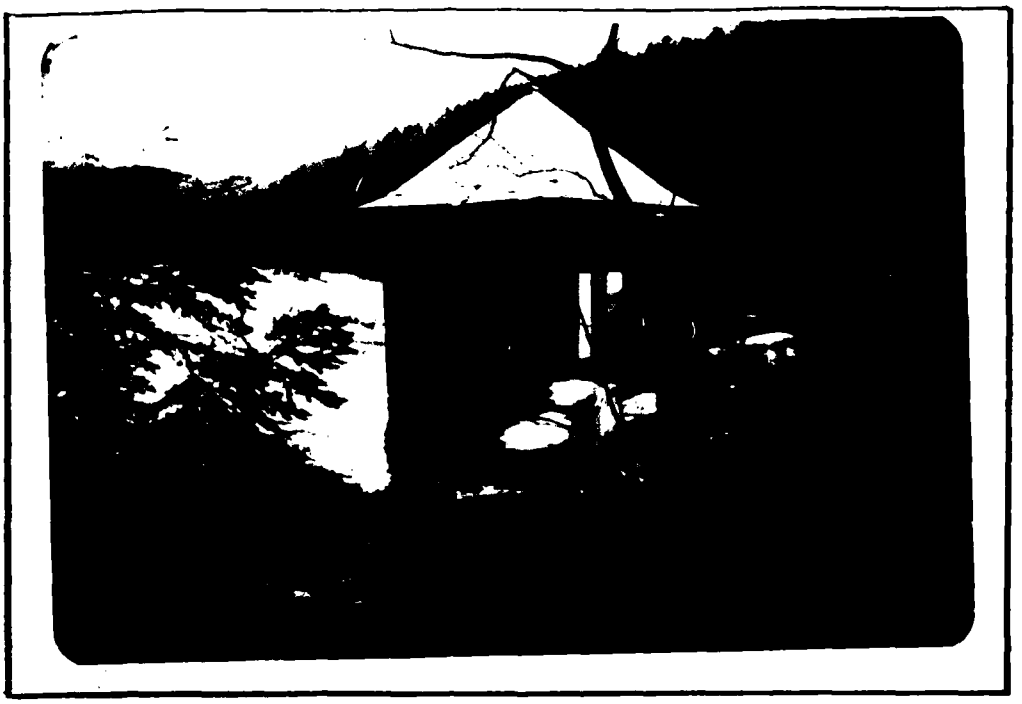
(1) The location and direction in which each photo was taken and the number of the photo.

SITE PLAN

1. CREST OF DAM SHOWING GATE HOUSE, HOIST PLATFORM AND HOIST, AND CONCRETE WALL. (12/3/80)



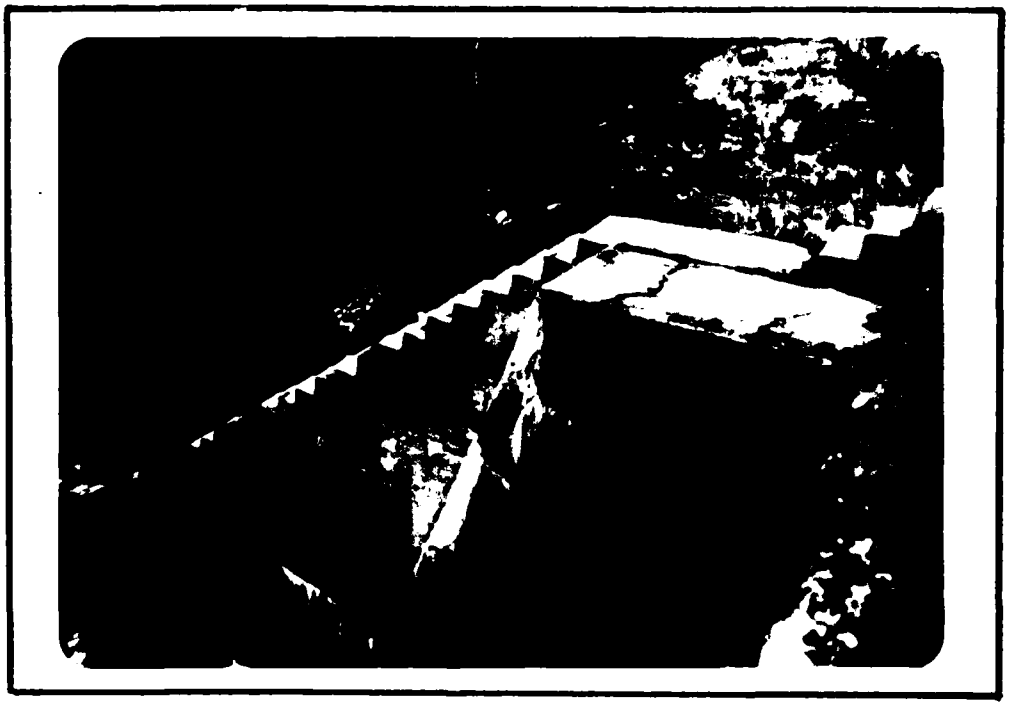
2. CLOSE-UP OF HOIST PLATFORM AND HOIST. (12/3/80)



3. GATEHOUSE AND IMPOUNDMENT AS VIEWED FROM THE RIGHT ABUTMENT. (12/3/80)

4. CLOSE-UP OF THE GATEHOUSE. (12/3/80)

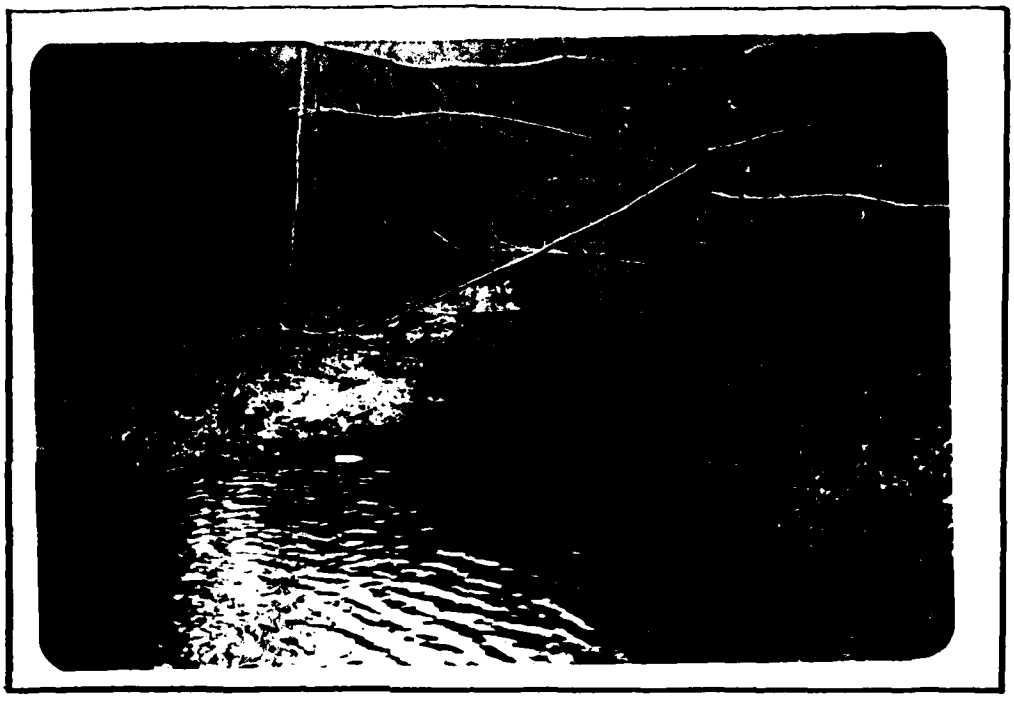
5. SPILLWAY AS OBSERVED FROM THE LEFT ABUTMENT. (12/3/80)



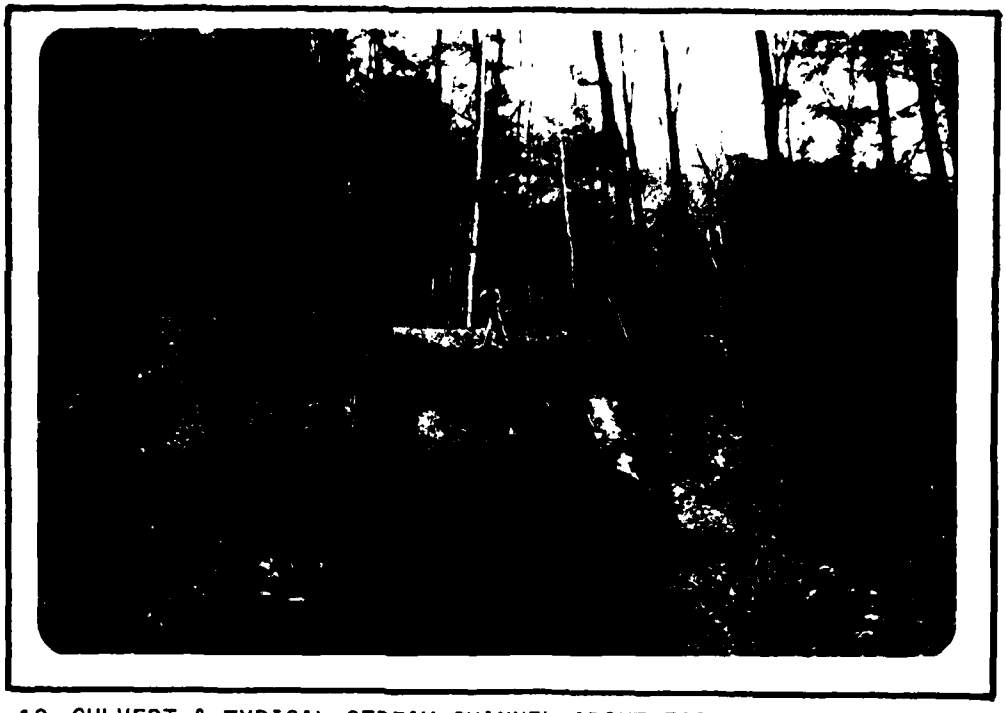
6. SPILLWAY EXIT CHANNEL AS SEEN FROM THE WALKWAY OVER THE SPILLWAY. (12/3/80)

7. LOOKING UPSTREAM ALONG THE SPILLWAY EXIT CHANNEL. (12/3/80)

8. DOWNSTREAM FACE OF DAM AS OBSERVED FROM THE DOWNSTREAM RIGHT ABUTMENT. (12/3/80)



9. STREAM DOWNSTREAM OF THE SPILLWAY EXIT CHANNEL. (12/3/80)



10. CULVERT & TYPICAL STREAM CHANNEL ABOUT 700 FEET DOWNSTREAM OF THE DAM. (12/3/80)

11. CULVERT AND TYPICAL STREAM CHANNEL ABOUT 1.5 MILES DOWNSTREAM OF THE DAM. (12/3/80)

12. POSSIBLE DAMAGE AREA APPROXIMATELY 2 MILES DOWNSTREAM OF THE DAM. (12/3/80)

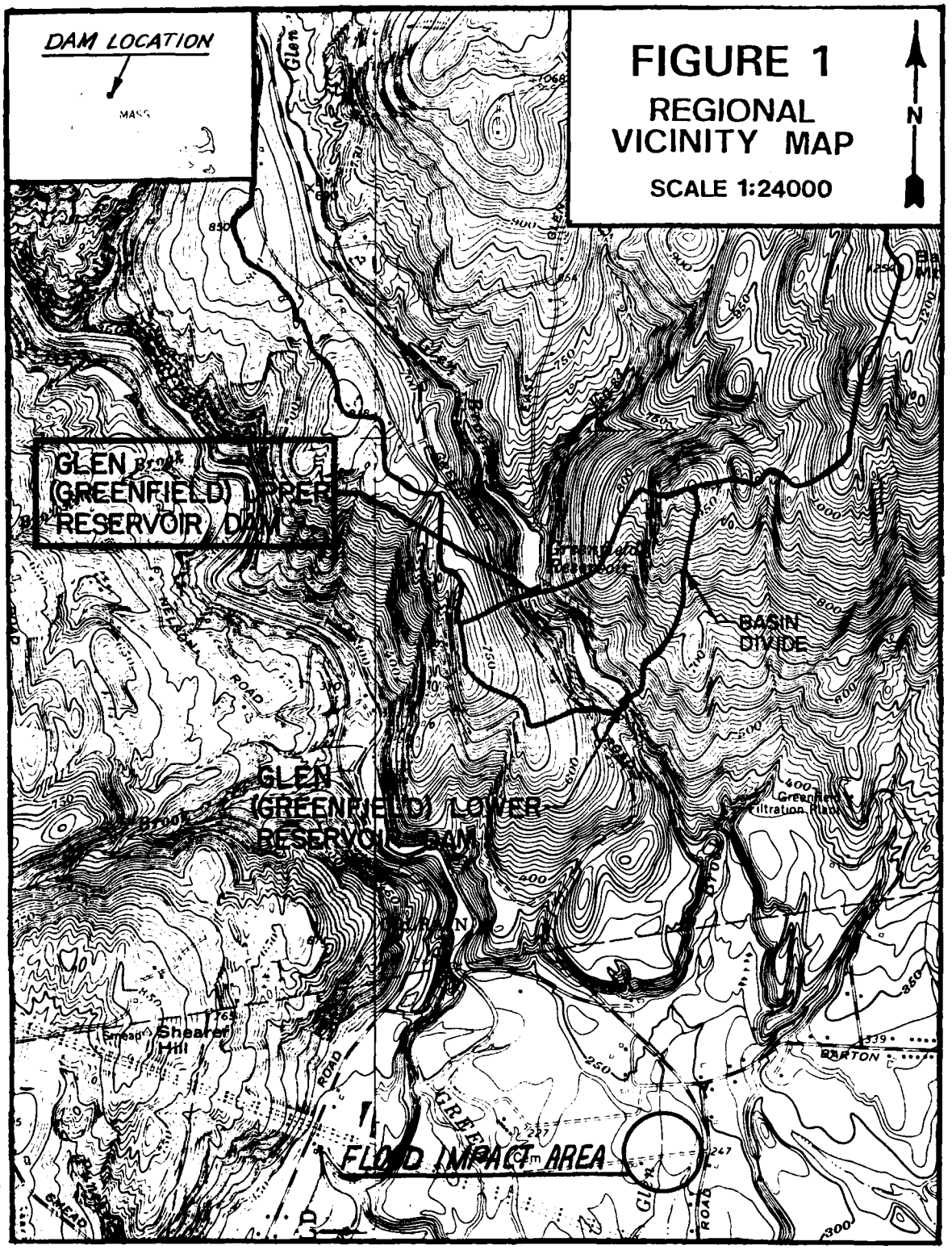
APPENDIX D

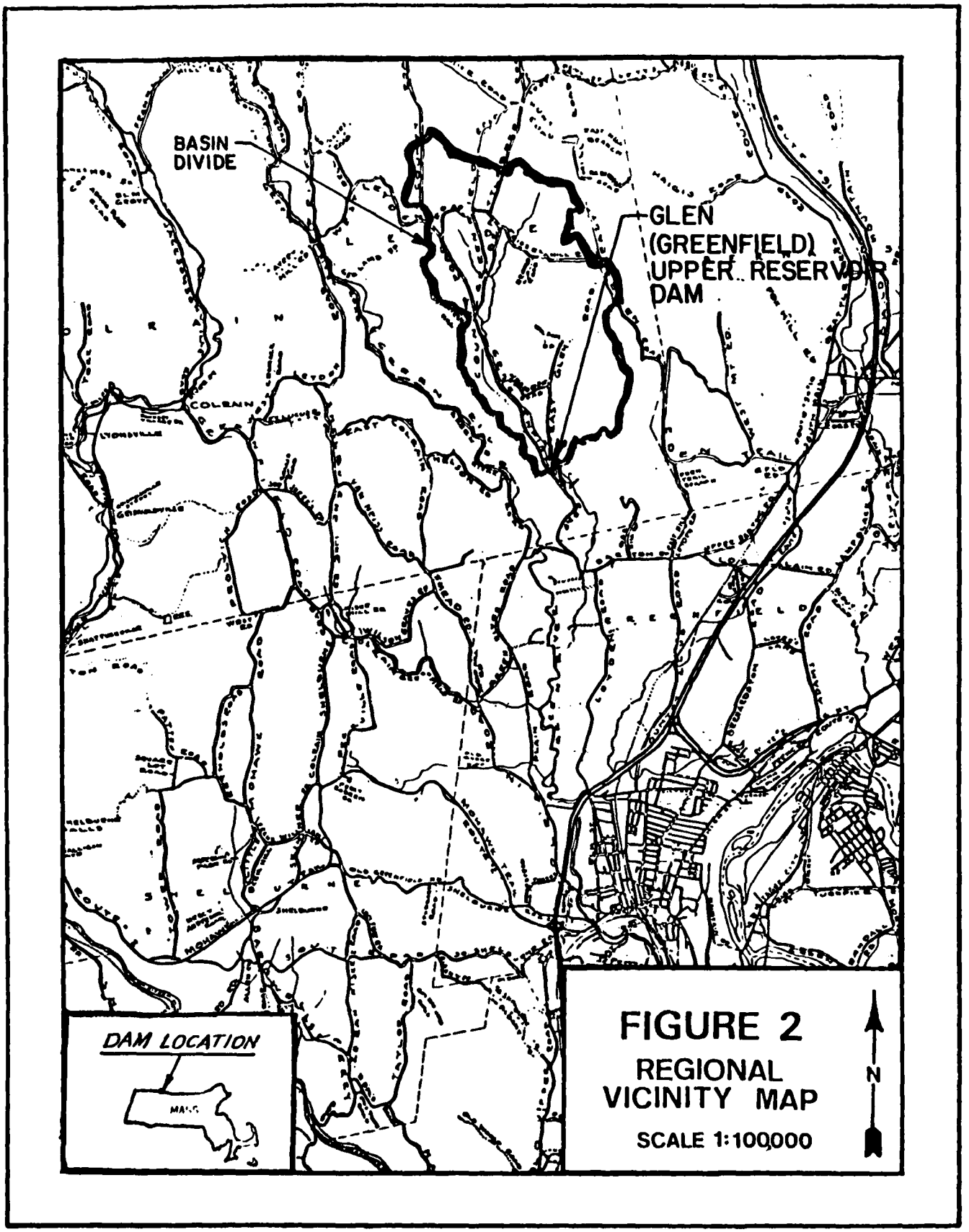
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

TABLE OF CONTENTS


DAM LOCATION
MASS
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24000
N
GLEN Brook
(GREENFIELD) UPPER
RESERVOIR DAM
GLEN
(GREENFIELD) LOWER
RESERVOIR DAM
BASIN
DIVIDE
Greenfield
Filtration Plant
Shearer
Hill
BARTON
FLOOD IMPACT AREA
ROAD


BASIN DIVIDE
GLEN (GREENFIELD) UPPER RESERVOIR DAM
COLRAIN
DAM LOCATION
MASS.
FIGURE 2
REGIONAL VICINITY MAP
SCALE 1:100,000
N

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-3	ADH	12/15/60	2060.002

(I.) Drainage Area - 5.2 sq. mi.

(II.) Snyder Hydrograph Coefficients

- $C_t = 2.0$ & $C_p = 0.5$

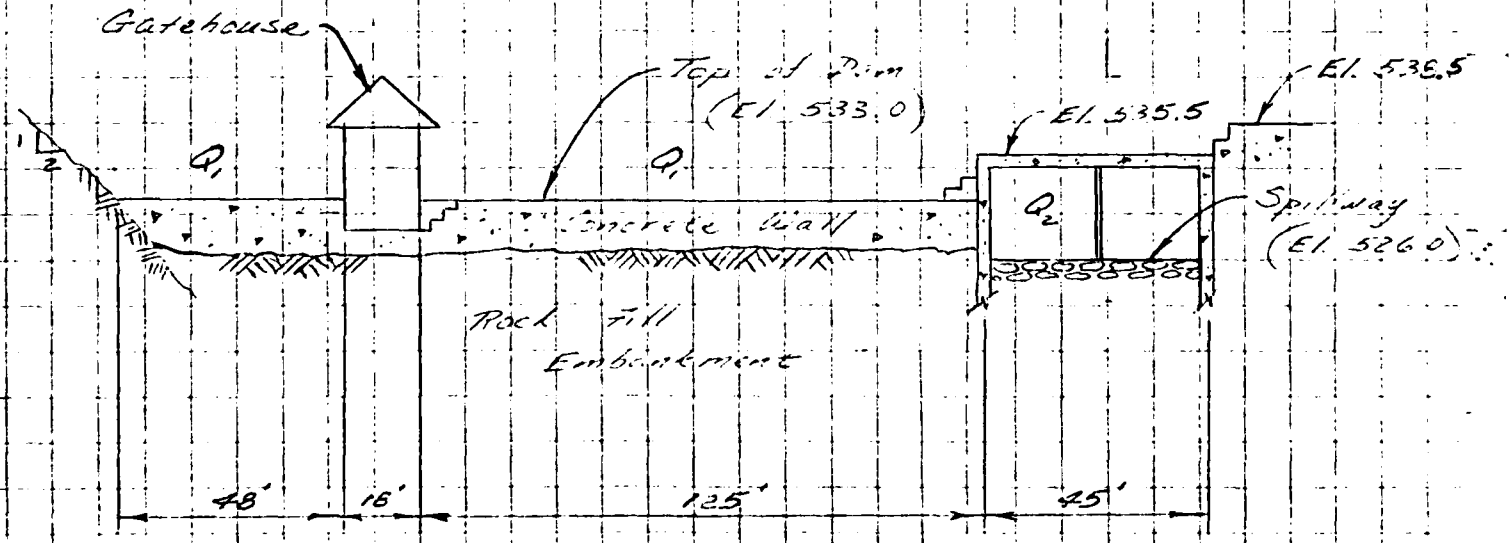
(III.) T_p Calculation

$$T_p = C_t (L \times L_{ca})^{0.3} = (2.0)(5.2 \times 2.4)^{.3} = 4.25 \text{ Hours}$$

- where L = main channel length from the outflow point to the upstream watershed boundary (river miles) and

L_{ca} = main channel length from the outflow point to a point opposite the center of the river basin (river miles)

(IV.) Sketch: Dam Elevation & Spillway Dimensions



Not to Scale (Looking Upstream)

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-4	ADH	12/15/80	3060.002

(V.) Stage - Discharge Relationship

Elevation (NGVD)	H_1 (ft)	Q_1 (cfs)	H_2 (ft)	Q_2 (cfs)	ΣQ (cfs)
526	0	0	—	—	0
527	1	117	—	—	117
528	2	330	—	—	330
529	3	606	—	—	606
530	4	933	—	—	933
531	5	1,304	—	—	1,304
532	6	1,714	—	—	1,714
533	7	2,160	0	0	2,160
534	8	2,638	1	502	3,140
535	9	2,698	2	959	3,657
535.5	9.5	2,733	2.5	1,983	4,716
536	10	3,156	3	3,285	6,441
537	11	3,865	4	5,058	8,923
538	12	4,463	5	7,068	11,531

Formulas:

Broad-crested Weir → $Q = CLH^{3/2}$

- where $C = 2.65$ at spillway
  $C = 2.9$ over dam

Submerged Spillway Inlet → $Q = Ca\sqrt{2gh}$

- where $C = 0.79$

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-5	ADH	12/15/80	2060.002

(VI.) Stage - Storage Relationship*

Description	Elevation (NGVD)	Area (acres)	Storage (acre-feet)
Toe of Dam	485.0	0	0
Spillway Crest	526.0	6.7	92
Top of Dam	533.0	7.1	143
Test Flood El.	535.0	7.7	159

* Areas have been determined from USGS maps, unless more detailed survey information is available. Storage data have been computed according to the conical method by the HEC-1 program.

(VII.) PMP DATA (Total D.A. ≈ 5.2 mi.²)

24-Hr. 200 mi.² probable maximum precipitation

= 20.2 inches (Ref: HMS #33)

Also,

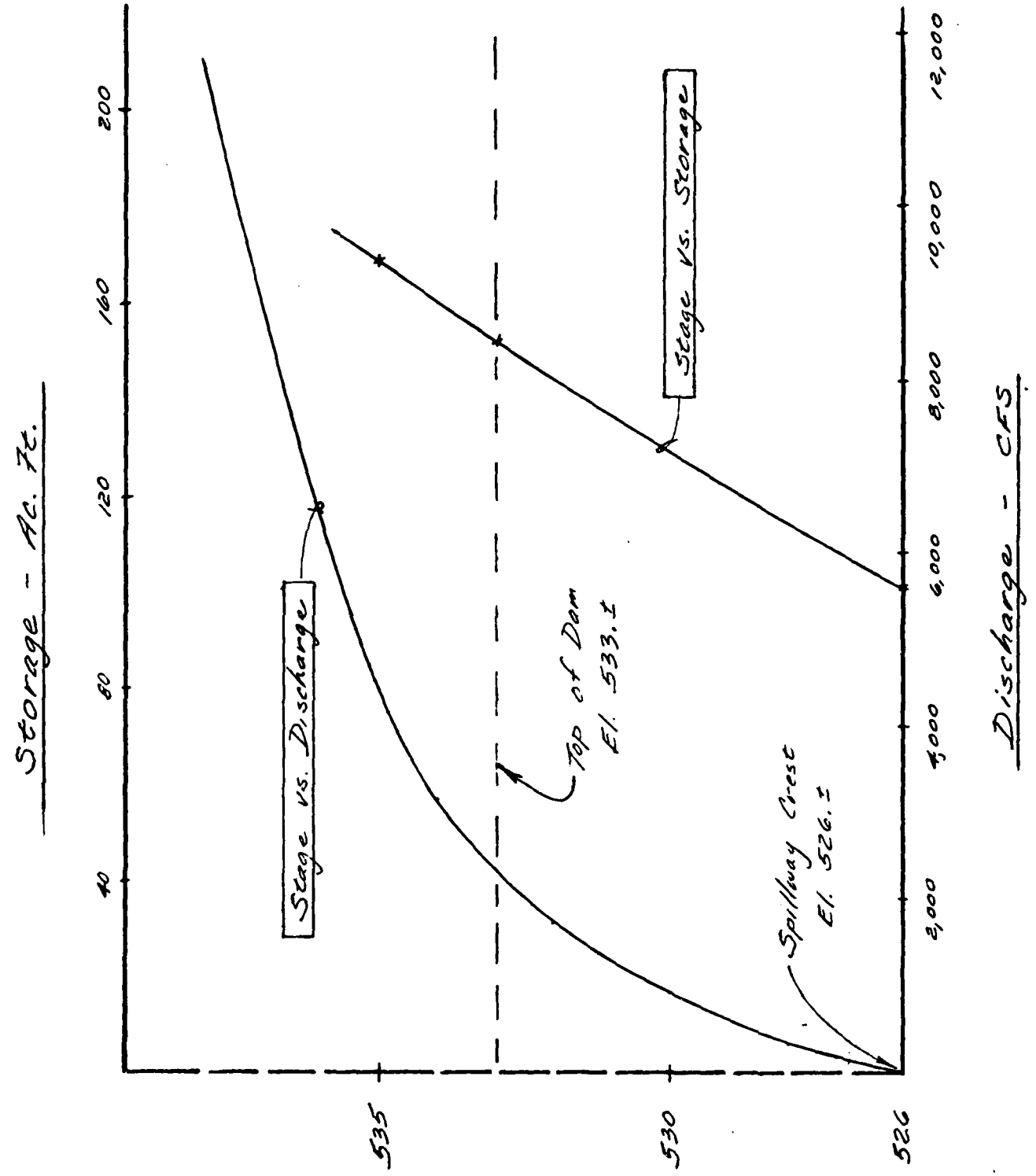
6-Hr. % of index for this basin ≈ 111

12-Hr. " " " " " " ≈ 123

24-Hr. " " " " " " ≈ 132

O'BRIEN & GERE ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-6	ADH	12/13/90	2060.002

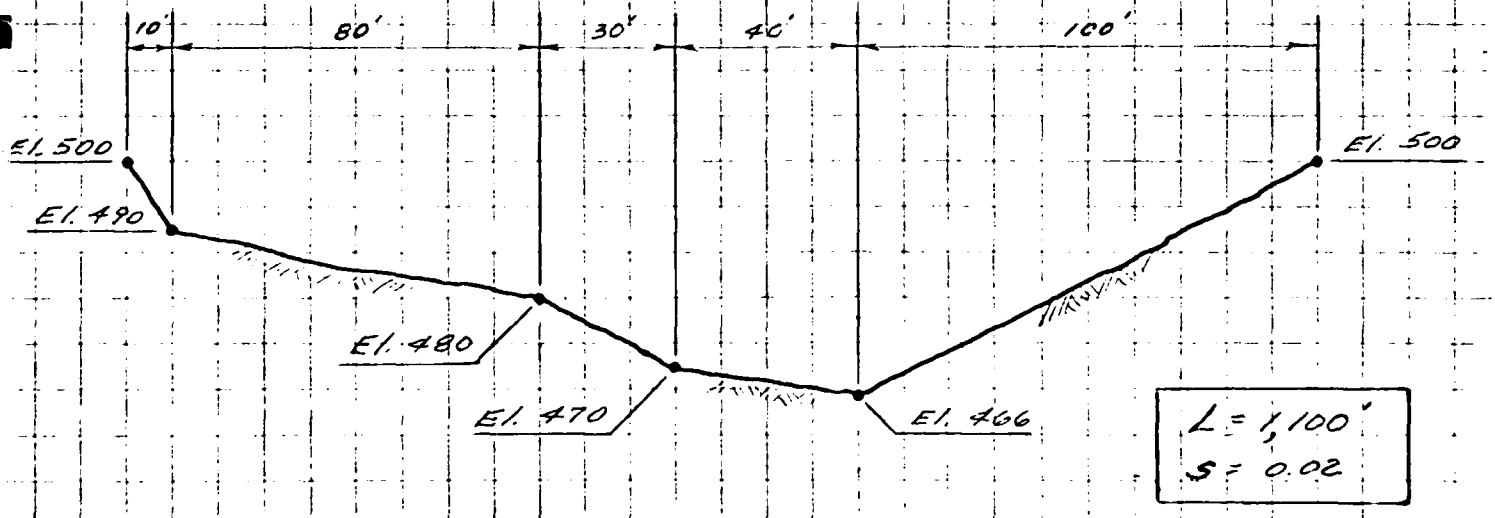


O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-7	ADH	12/15/80	2060.002

(VIII.) Downstream Routing Information

In performing the breach analysis of Upper Glen Reservoir Dam, it is necessary to route the flow through a portion of Glen Brook, through Lower Glen Reservoir, and through Glen Brook to the downstream hazard area. Pertinent routing information is presented in this Section.



Channel Cross Section (CHANLO)

(just upstream of Lower Glen Reservoir)

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-8	ADH	12/09/80	2060.002

Lower Glen Reservoir Dam - H&H

Drainage Area 5.4 sq. mi.

Snyder Hydrograph Coefficients

- $C_t = 2.0$ & $C_p = 0.5$

Tp Calculation

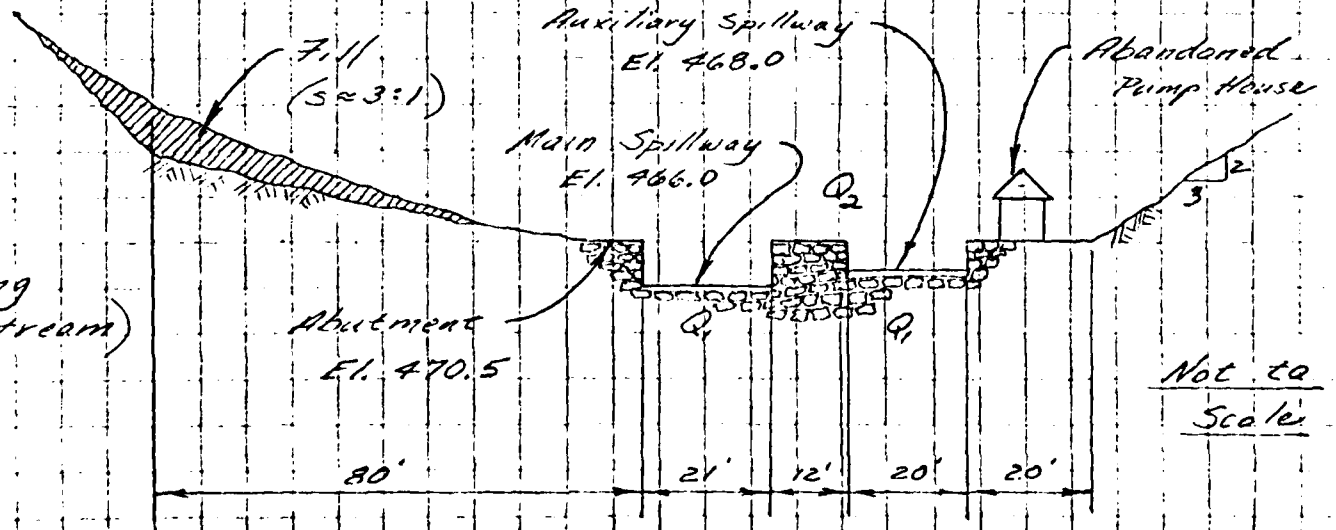
$$T_p = C_t (L \times L_{ca})^{0.3}$$

- where L = main channel length from the outflow point to the upstream watershed boundary (river miles) and

L_{ca} = main channel length from the outflow point to a point opposite the center of the river basin (river miles)

$\Rightarrow T_p = (2.0)(.63 \times .37)^{.3} = 1.18$ hr $\rightarrow$ say **1.25 Hours**

Sketch: Dam Elevation & Spillway Dimensions



Not to Scale

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-9	ADH	12/12/80	3060.002

Lower Glen Reservoir Dam - HEC-1

Stage - Discharge Relationship*

Elevation (NGVD)	H_1 (ft)	Q_1 (cfs)	H_2 (ft)	Q_2 (cfs)	ΣQ (cfs)
466	0	0	—	—	0
467	1	56	—	—	56
468	2	157	—	—	157
469	3	342	—	—	342
470	4	595	—	—	595
470.5	4.5	741	0	0	741
471	5	783	0.5	36	819
472	6	960	1.5	213	1,173
473	7	1,011	2.5	527	1,738
474	8	1,520	3.5	949	2,469
475	9	1,876	4.5	1,523	3,399
476	10	2,275	5.5	2,244	4,519
477	11	2,711	6.5	3,124	5,835
478	12	3,183	7.5	4,170	7,353
479	13	3,688	8.5	5,390	9,078
480	14	4,223	9.5	6,793	11,016
481	15	4,780	10.5	8,387	13,173

* Flows have been calculated based upon the weir flow formula: $Q = CLH^{3/2}$

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-10	ADH	12/12/80	2060.002

Lower Glen Reservoir Dam - H&H

Flow Coefficients: (Broad-crested weir)

C = 2.65 for flow over spillway up to top of dam elevation 470.5

C = 2.9 for flow over dam and for flows over the spillway above elevation 470.5

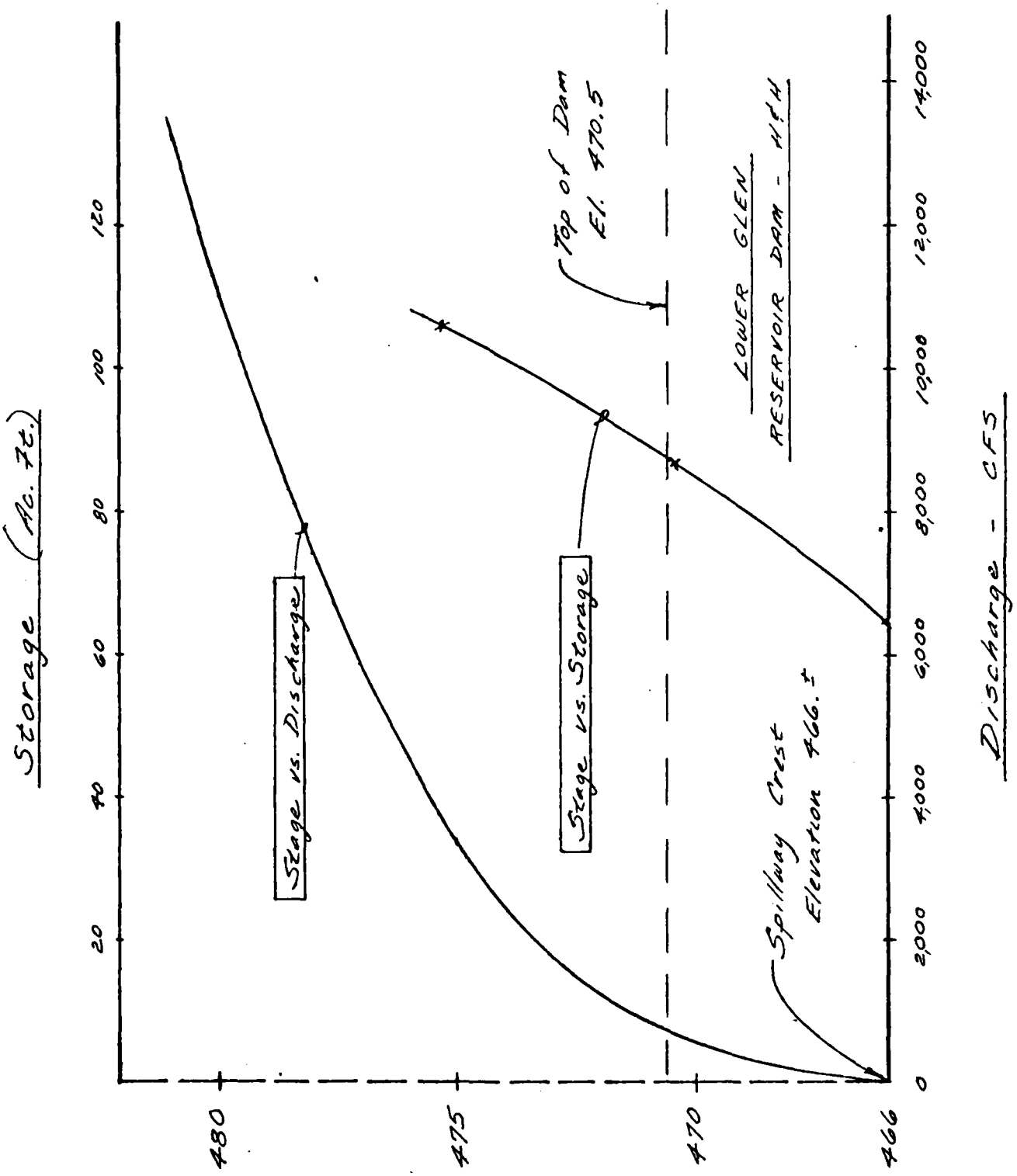
Stage - Storage Relationship*

Description	Elevation (NGVD)	Area (acres)	Storage (acre-feet)
Toe of Dam	424.5	0	0
Spillway Crest	466.0	4.8	64
Top of Dam	470.5	5.1	87
Test Flood El.	475.3	5.7	114

* Areas have been determined from USGS maps, unless more detailed survey information was made available. Storage data have been computed according to the conical method by the HEC-1 program.

O'BRIEN & GERE
ENGINEERS, INC.

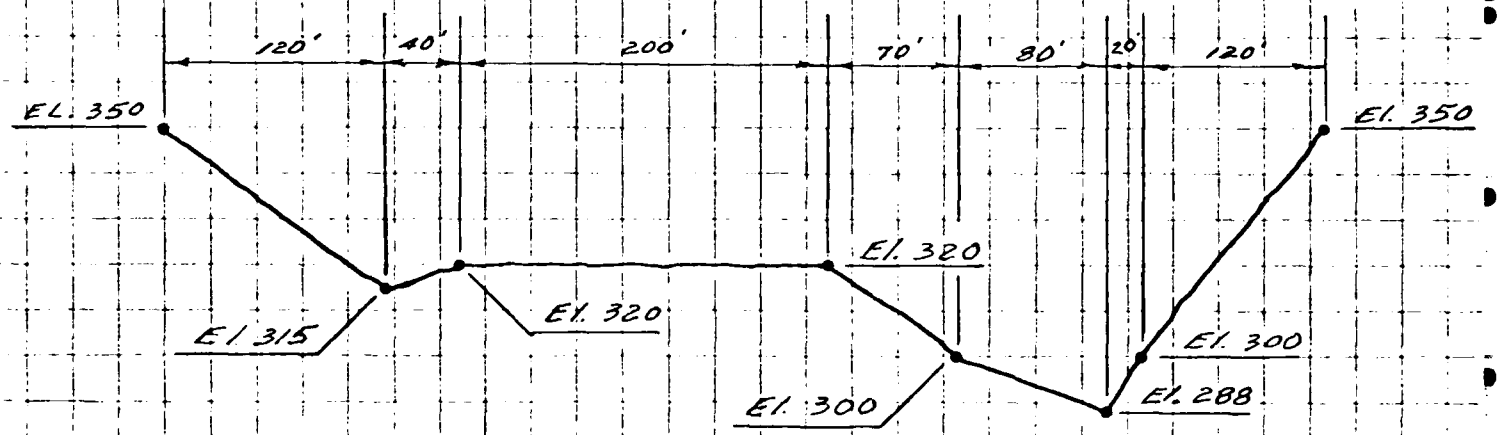
SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-11	ADH	12/12/80	2060.002



O'BRIEN & GERE

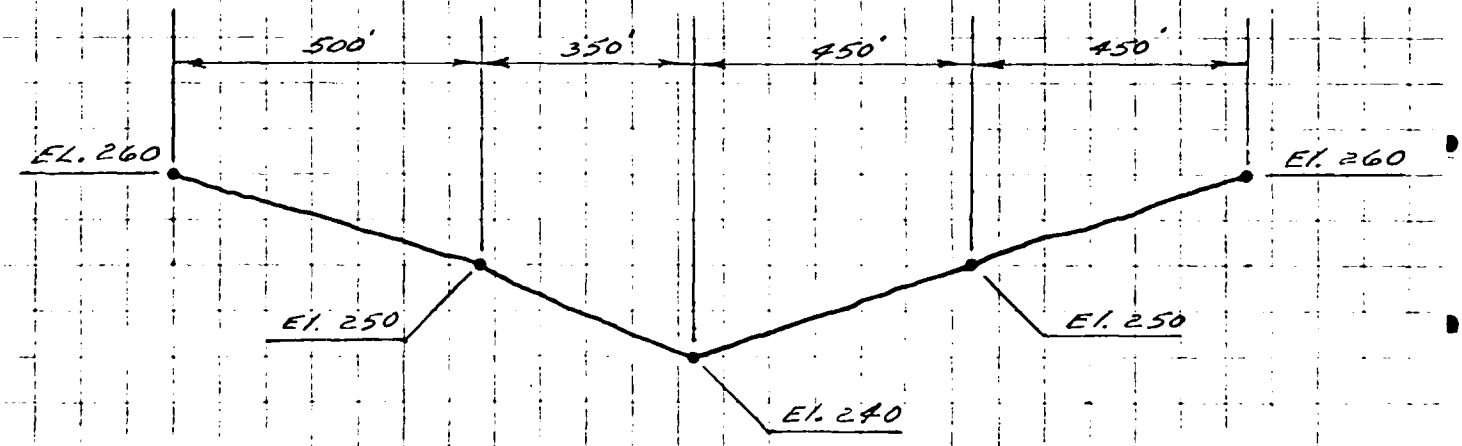
SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-12	ADH	12/16/80	3060.00.2

(VIII.) Downstream Routing Information (Cont.)



L = 2800'
S = 0.05

Channel Cross Section
(Stream Transition No. 1)



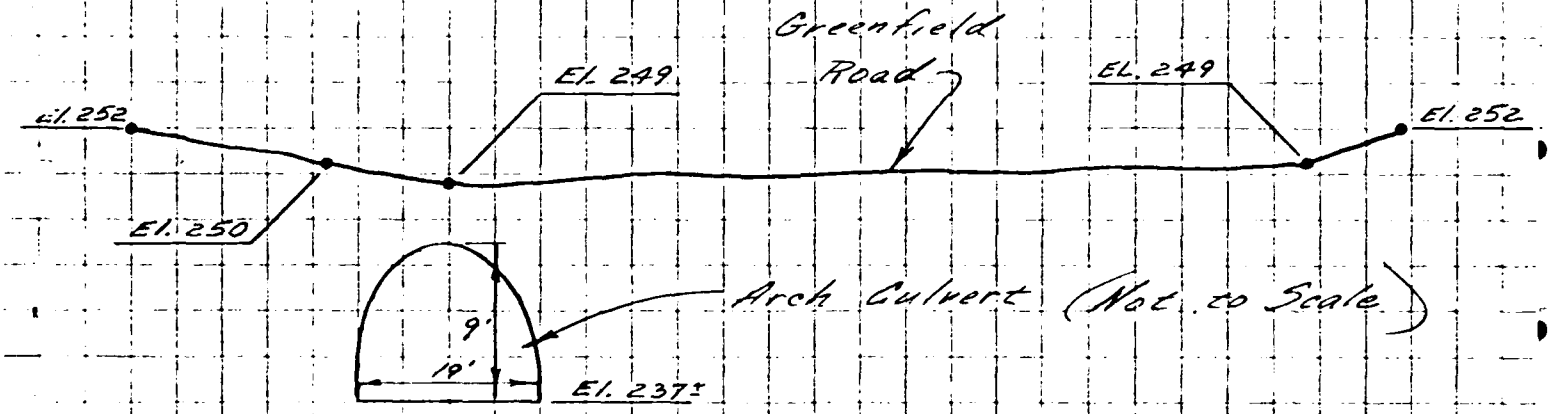
L = 3600'
S = 0.013

Channel Cross Section
(Stream Transition No. 2)

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-13	ADH	12/16/80	3060.002

(VIII.) Downstream Routing Information (Cont.)



Cross Section - Greenfield Road Culvert

(looking downstream)

Stage - Discharge Tabulation - Greenfield Rd. Culvert

Elevation (NGVD)	Hi (ft.)	Q* (cfs)	Elevation (NGVD)	Hi (ft.)	Q (cfs)
237	0	0	245	8	1,096
238	1	125	246	9	1,113
239	2	324	247	10	1,159
240	3	529	248	11	1,269
241	4	714	249	12	1,371
242	5	868	250	13	3,946
243	6	983	251	14	9,622
244	7	1060	252	15	18,391

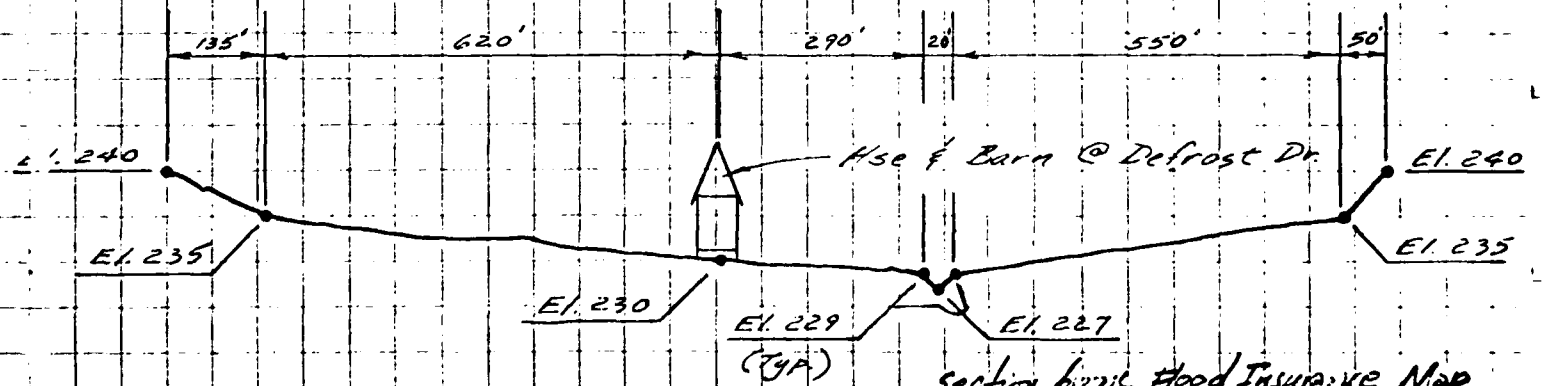
* see next page

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Upper Glen Reservoir Dam	D-14	ADH	12/16/80	3060.002

(VIII.) Downstream Routing Information (Cont.)

NOTE: The stage-discharge relationship for the Greenfield Road culvert crossing was developed using the orifice equation for flow through the culvert ($Q = Ca\sqrt{2gh}$) and the standard weir flow equation for flow over the road ($Q = CLH^{3/2}$). The coefficients were chosen to be 0.68 and 3.1, respectively. Also, for open channel flow through the culvert, Mannings Equation was used. ($Q = \left(\frac{1.49}{n}\right) A R^{2/3} S^{1/2}$) Values of 0.025 and 0.02 were assumed for "n" and "S", respectively.



Section Bivic Flood Insurance Map
5-E 6/19/70

Channel Cross Section @ Hazard Area

FOR TECHNICAL ASSISTANCE CONTACT
ARLEN FEldman - JOHN PETTIS, or PAUL P...
at THE HYDROLOGIC ENGINEERING CENTER
916-440-2329 (FTS 448-2329)

```
1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION  JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********
     1  A1        HYDROLOGIC ANALYSIS OF UPPER GLEN RESERVOIR DAM
     2  A2              NATIONAL DAM INSPECTION PROGRAM
     3  A3        NEW ENGLAND DIVISION - CORPS OF ENGINEERS
     4  B   300    0    15    0    0    0    0    0   -4    0
     5  B1    5
     6  J     1    9     1
     7  J1   .2   .3    .4   .5   .6   .7   .8   .9  1.0
     8  K     0  INFUP                          1
     9  K1                INFLOW TO UPPER GLEN RESERVOIR
    10  M     1    1   5.2    0                          1
    11  P     0 20.2   111  123  132
    12  T                                    0  0.05
    13  W  4.25  0.6
    14  X  -1.7 -0.1     2
    15  K     1  OUTUP                         1
    16  K1              ROUTED OUTFLOW FROM UPPER GLEN RESERVOIR
    17  Y                          1    1
    18  Y1    1                                   -526   -1
    19  Y4  526  527   528  529  530  531  532  533  534  535
    20  Y4 535.5 536   537  538  539
    21  Y5    0  117   330  606  933 1304 1714 2160 3140 3657
    22  Y5 4716 6441  8923 11531 14602
    23  $A    0  6.7   9.3
    24  $E  485  526   540
    25  $$  526
    26  $D  533
    27  K    99
1            PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                  RUNOFF HYDROGRAPH AT      INFUP
                  ROUTE HYDROGRAPH TO       OUTUP
                  END OF NETWORK

1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION  JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********

 RUN  DATE= 81/01/02.
      TIME= 13.46.16.

          HYDROLOGIC ANALYSIS OF UPPER GLEN RESERVOIR DAM
                NATIONAL DAM INSPECTION PROGRAM
          NEW ENGLAND DIVISION - CORPS OF ENGINEERS

                      JOB SPECIFICATION
      NQ    NHR   NMIN   IDAY   IHR   IMIN  METRC  IPLT  IPRT  NSTAN
     300      0     15      0     0      0      0     0    -4      0
                  JOPER    NWT  LROPT  TRACE
                      5      0      0      0

          MULTI-PLAN ANALYSES TO BE PERFORMED
                NPLAN= 1 NRTIO= 9 LRTIO= 1
   RTIOS=   .20   .30   .40   .50   .60   .70   .80   .90  1.00
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SUB-AREA RUNOFF COMPUTATION

INFLOW TO UPPER GLEN RESERVOIR

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	INFUP	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

	IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
	1	1	5.20	0.00	5.20	0.00	0.000	0	1	0

PRECIP DATA

	SPFE	PMS	R6	R12	R24	R48	R72	R96
	0.00	20.20	111.00	123.00	132.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

	LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
	0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 4.25 CP= .60 NTA= 0

RECESSION DATA

STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 4.23 HOURS, CP= .60 VOL= .99

7.	26.	53.	85.	121.	160.	201.	243.	287.	331.
371.	406.	434.	457.	473.	484.	487.	483.	466.	441.
416.	393.	371.	350.	330.	312.	294.	278.	262.	247.
233.	220.	208.	196.	185.	175.	165.	156.	147.	139.
131.	123.	117.	110.	104.	98.	92.	87.	82.	78.
73.	69.	65.	62.	58.	55.	52.	49.	46.	44.
41.	39.	37.	35.	33.	31.	29.	27.	26.	24.
23.	22.	21.	19.	18.	17.	16.	15.	15.	14.
13.	12.	12.	11.	10.	10.	9.	9.	8.	8.
7.	7.	6.	6.	6.	5.	5.	5.	5.	4.

Q END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	21.33	20.13	1.20	269544.
										(542.)	(511.)	(30.)	(7632.64)

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HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM UPPER GLEN RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUTUP	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-526.	-1

STAGE	526.00	527.00	528.00	529.00	530.00	531.00	532.00	533.00	534.00	535.00
	535.50	536.00	537.00	538.00	539.00					
FLOW	0.00	117.00	330.00	606.00	933.00	1304.00	1714.00	2160.00	3140.00	3657.00
	4716.00	6441.00	8923.00	11531.00	14602.00					
SURFACE AREA=	0.	7.	9.							
CAPACITY=	0.	92.	203.							
ELEVATION=	485.	526.	540.							

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
526.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
533.0	0.0	0.0	0.

PEAK OUTFLOW IS 1468. AT TIME 20.00 HOURS

PEAK OUTFLOW IS 2211. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 2947. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 3687. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 4423. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 5160. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 5897. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 6635. AT TIME 19.75 HOURS

PEAK OUTFLOW IS 7372. AT TIME 19.75 HOURS

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1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .60	RATIO 6 .70	RATIO 7 .80	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	INFUP	5.20	1	1474.	2211.	2948.	3685.	4422.	5160.	5897.	6634.	7371.
		(13.47)		(41.74)(	62.61)(	83.49)(	104.36)(	125.23)(	146.10)(	166.97)(	187.84)(	208.72)
ROUTED TO	OUTUP	5.20	1	1468.	2211.	2947.	3687.	4423.	5160.	5897.	6635.	7372.
		(13.47)		(41.57)(	62.61)(	83.45)(	104.41)(	125.23)(	146.11)(	166.99)(	187.87)(	208.75)

1

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	526.00	526.00	533.00
STORAGE	92.	92.	143.
OUTFLOW	0.	0.	2160.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	531.40	0.00	130.	1468.	0.00	20.00	0.00
.30	533.05	.05	143.	2211.	1.00	19.75	0.00
.40	533.80	.80	149.	2947.	4.25	19.75	0.00
.50	535.01	2.01	159.	3687.	6.00	19.75	0.00
.60	535.36	2.36	162.	4423.	7.25	19.75	0.00
.70	535.63	2.63	164.	5160.	8.50	19.75	0.00
.80	535.84	2.84	166.	5897.	9.25	19.75	0.00
.90	536.00	3.00	168.	6635.	10.00	19.75	0.00
1.00	536.38	3.38	171.	7372.	10.75	19.75	0.00

EOI ENCOUNTERED.
C-bye
JOB PROCESSING CCUS 2.628
DO YOU WISH TO RATE EKS SERVICE?
I-n
THANK YOU.

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1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********
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1	A1	HYDROLOGIC ANALYSIS OF UPPER GLEN RESERVOIR DAM BREACH										
2	A2	NATIONAL DAM INSPECTION PROGRAM										
3	A3	NEW ENGLAND DIVISION - CORPS OF ENGINEERS										
4	B	300	0	10	0	0	0	0	0	-4	0	
5	B1	5										
6	J	2	1	1								
7	J1	.3										
8	K	0	INFUP					1				
9	K1	INFLOW TO UPPER GLEN RESERVOIR										
10	M	1	1	5.2		0				1		
11	P	0	20.2	111	123	132						
12	T							0	0.05			
13	W	4.25	0.6									
14	X	-1.7	-0.1	2								
15	K	1	OUTUP					1				
16	K1	ROUTED OUTFLOW FROM UPPER GLEN RESERVOIR										
17	Y				1	1						
18	Y1	1						-526	-1			
19	Y4	526	527	528	529	530	531	532	533	534	535	
20	Y4	535.5	536	537	538	539						
21	Y5	0	117	330	606	933	1304	1714	2160	3140	3657	
22	Y5	4716	6441	8923	11531	14602						
23	KA	0	6.7	9.3								
24	KE	485	526	540								
25	KK	526										
26	KO	533										
27	KB	60	0.01	485	1.0	526	533					
28	KB	60	0.01	485	1.0	526	540					
29	K	1	CHANLO					1				
30	K1	CHANNEL ROUTING TO LOWER GLEN RESERVOIR										
31	Y				1	1						
32	Y1	1						-1				
33	Y6	0.08	0.04	0.08	466	500	1100	102				
34	Y7	0	500	10	490	90	480	120	470	160	466	
35	Y7	258	499	259	499.5	260	500					
36	K	1	GLENLO					1				
37	K1	ROUTED OUTFLOW THROUGH LOWER GLEN RESERVOIR										
38	Y				1	1						
39	Y1	1						466	-1			
40	Y4	466	467	468	469	470	470.5	471	472	473	474	
41	Y4	475	476	477	478	479	480	481				
42	Y5	0	56	157	342	595	741	819	1173	1738	2469	
43	Y5	3399	4719	6835	7353	9078	11016	13173				
44	KA	0	4.8	7.1								
45	KE	430	466	485								

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   46                $$   466
   47                $D 470.5
   48                K      1    DS-1                                          1
   49                K1                CHANNEL ROUTING TO STREAM TRANSITION 1
   50                Y                                  1       1
 1 51                Y1     1                                                 -1
   52                Y6  0.08    0.04    0.08     288     350    2800   0.05
   53                Y7     0     350     120     315     160     320    360     320     430     300
   54                Y2   510     288     530     300     650     350
   55                K      1    DS-2                                          1
   56                K1                CHANNEL ROUTING TO STREAM TRANSITION 2
   57                Y                                  1       1
   58                Y1     1                                                 -1
   59                Y6  0.06    0.04    0.06     240     260    3600   .013
   60                Y7     0     260       1     259       2     259    500     250     850     240
   61                Y7  1300     250    1750     260    1751     261
   62                K      1   GREEN                                         1
   63                K1                ROUTED OUTFLOW THROUGH GREENFIELD RD CULVERT
   64                Y                                  1       1
   65                Y1     1                                                 -1      -1
   66                Y4   237     238     239     240     241     242    243     244     245     246
   67                Y4   247     248     249     250     251     252
   68                Y5     0     125     324     529     714     868    983    1060    1096    1113
   69                Y5  1159    1269    1371    3946    9622   10391
   70                YA     0    10.4    19.1
   71                YE   237     249     255
   72                $$ 237.1
   73                $D   249
   74                K      1   HAZARD                                        1
   75                K1                CHANNEL ROUTING TO HAZARD CENTER
   76                Y                                  1       1
   77                Y1     1                                                 -1
   78                Y6  0.05    0.04    0.05     227     240    1400   .01
   79                Y7     0     240     135     235     755     230   1045     229    1055     227
   80                Y7  1065     229    1615     235    1665     240
   81                K     99
1                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                  RUNOFF HYDROGRAPH AT      INFLOW
                                  ROUTE HYDROGRAPH TO       OUTLOW
                                  ROUTE HYDROGRAPH TO       CHANLO
                                  ROUTE HYDROGRAPH TO       CLENLO
                                  ROUTE HYDROGRAPH TO       DS-1
                                  ROUTE HYDROGRAPH TO       DS-2
                                  ROUTE HYDROGRAPH TO       GREEN
                                  ROUTE HYDROGRAPH TO       HAZARD
                                  END OF RUNOFF
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HYDROLOGIC ANALYSIS OF UPPER GLEN RESERVOIR DAM BREACH
NATIONAL DAM INSPECTION PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 2 NRTIO= 1 LRTIO= 1

RTIOS= .30

SUB-AREA RUNOFF COMPUTATION

INFLOW TO UPPER GLEN RESERVOIR

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	INFUP	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	5.20	0.00	5.20	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.20	111.00	123.00	132.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 4.25 CP= .60 NTA= 0

RECESSION DATA
STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 4.25 HOURS, CP= .60 VOL= .96

4.	14.	30.	48.	69.	92.	116.	142.	169.	197.
225.	255.	284.	315.	344.	371.	395.	416.	435.	451.
465.	476.	484.	489.	491.	489.	483.	470.	452.	435.
419.	403.	387.	373.	359.	345.	332.	319.	307.	295.
284.	273.	263.	253.	243.	234.	225.	217.	208.	201.
193.	186.	179.	172.	165.	159.	153.	147.	142.	136.
131.	126.	121.	117.	112.	108.	104.	100.	96.	93.
89.	86.	82.	79.	76.	73.	70.	68.	65.	63.
60.	58.	56.	54.	52.	50.	48.	46.	44.	43.
41.	39.	38.	36.	35.	34.	32.	31.	30.	29.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	21.33	20.13	1.20	393600.
										(542.)(511.)(30.)(11145.51)			

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM UPPER GLEN RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUTUP	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-526.	-1

STAGE	526.00	527.00	528.00	529.00	530.00	531.00	532.00	533.00	534.00	535.00
	535.50	536.00	537.00	538.00	539.00					
FLOW	0.00	112.00	330.00	606.00	933.00	1304.00	1714.00	2160.00	3140.00	3657.00
	4716.00	6441.00	8923.00	11531.00	14602.00					
SURFACE AREA=	0.	7.	9.							
CAPACITY=	0.	92.	203.							
ELEVATION=	485.	526.	540.							

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
526.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
533.0	0.0	0.0	0.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
60.	.01	485.00	1.00	526.00	533.00

BEGIN DAM FAILURE AT 19.35 HOURS

PEAK OUTFLOW IS 6350. AT TIME 19.90 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
60.	.01	485.00	1.00	526.00	540.00

PEAK OUTFLOW IS 2218. AT TIME 19.67 HOURS

HYDROGRAPH ROUTING

CHANNEL ROUTING TO LOWER GLEN RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
CHANLO	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

	0.00	0.00	0.00	0.00	10.0	20.0
	258.00	499.00	259.00	499.50	260.00	500.00

STORAGE	0.00	.52	2.10	4.55	7.51	10.95	14.87	19.27	24.16	29.80
	36.33	43.75	52.05	61.24	71.22	81.57	92.24	103.23	114.54	126.16
OUTFLOW	0.00	100.42	637.97	1949.48	4009.33	6825.67	10452.72	14948.50	20482.78	27529.74
	35664.83	44969.33	55516.44	67375.49	80781.88	95672.68	111906.09	129475.97	148382.41	170316.87
STAGE	466.00	467.79	469.58	471.37	473.16	474.95	476.74	478.53	480.32	482.11
	483.89	485.68	487.47	489.26	491.05	492.84	494.63	496.42	498.21	500.00
FLOW	0.00	100.47	637.97	1949.48	4009.33	6825.67	10452.72	14948.50	20482.78	27529.74
	35664.83	44969.33	55516.44	67375.49	80781.88	95672.68	111906.09	129475.97	148382.41	170316.87

MAXIMUM_STAGE IS 474.3

MAXIMUM STAGE IS 471.6

HYDROGRAPH ROUTING

ROUTED OUTFLOW THROUGH LOWER GLEN RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
GLENLO	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-466.	-1

STAGE	466.00	467.00	468.00	469.00	470.00	470.50	471.00	472.00	473.00	474.00
	475.00	476.00	477.00	478.00	479.00	480.00	481.00			
FLOW	0.00	56.00	157.00	342.00	595.00	741.00	819.00	1173.00	1738.00	2469.00
	3399.00	4519.00	5835.00	7353.00	9078.00	11016.00	13123.00			

SURFACE AREA=	0.	5.	7.
CAPACITY=	0.	58.	170.
ELEVATION=	430.	466.	485.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
466.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

IOPEL	COOD	EXPD	DAMWID
470.5	0.0	0.0	0.

PEAK OUTFLOW IS 5861. AT TIME 20.00 HOURS

PEAK OUTFLOW IS 5217. AT TIME 12.83 HOURS

HYDROGRAPH ROUTING

CHANNEL ROUTING TO STREAM TRANSITION 1

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BS 1	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0800	.0400	.0800	288.0	350.0	2800.	.05000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 350.00 120.00 315.00 160.00 320.00 360.00 320.00 430.00 300.00
510.00 288.00 530.00 300.00 650.00 350.00

STORAGE	0.00	2.85	11.41	25.67	45.54	69.84	98.18	130.55	166.96	209.47
	271.52	373.95	480.37	590.78	705.18	823.56	945.94	1072.31	1202.66	1337.01
OUTFLOW	0.00	452.94	2875.97	8479.32	18568.95	33998.54	54349.36	79954.62	111166.51	148488.84
	130240.97	215554.21	319170.19	440055.53	577524.11	731091.97	900405.99	1085203.73	1285288.62	1500513.67
STAGE	288.00	291.26	294.53	297.79	301.05	304.32	307.58	310.84	314.11	317.37
	320.63	323.89	327.16	330.42	333.68	336.95	340.21	343.47	346.74	350.00
FLOW	0.00	452.94	2875.97	8479.32	18568.95	33998.54	54349.36	79954.62	111166.51	148488.84
	130240.97	215554.21	319170.19	440055.53	577524.11	731091.97	900405.99	1085203.73	1285288.62	1500513.67

MAXIMUM STAGE IS 296.3

MAXIMUM STAGE IS 293.6

HYDROGRAPH ROUTING

CHANNEL ROUTING TO STREAM TRANSITION 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DS-2	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	ISK	SIOBA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0600	.0400	.0600	240.0	260.0	3600.	.01300

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 260.00 1.00 259.00 2.00 259.00 500.00 250.00 850.00 240.00
1300.00 250.00 1750.00 260.00 1751.00 261.00

STORAGE	0.00	3.66	14.65	32.97	58.61	91.57	131.87	179.48	234.43	296.70
	366.52	445.31	533.28	630.44	736.78	852.32	977.04	1110.95	1254.05	1401.17
OUTFLOW	0.00	122.60	778.99	2276.71	4246.25	8260.16	14583.21	21997.73	31406.76	42996.17
	57470.67	74971.45	95170.20	118259.46	144419.09	173821.01	206631.23	243010.97	283117.33	334822.01
STAGE	240.00	241.05	242.11	243.16	244.21	245.26	246.32	247.37	248.42	249.47
	250.53	251.58	252.63	253.68	254.74	255.79	256.84	257.89	258.95	260.00
FLOW	0.00	122.60	778.99	2276.71	4246.25	8260.16	14583.21	21997.73	31406.76	42996.17
	57470.67	74971.45	95170.20	118259.46	144419.09	173821.01	206631.23	243010.97	283117.33	334822.01

MAXIMUM STAGE IS 244.3

MAXIMUM STAGE IS 243.1

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HYDROGRAPH ROUTING

ROUTED OUTFLOW THROUGH GREENFIELD RD CULVERT

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
GREEN	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	-1

STAGE	237.00	238.00	239.00	240.00	241.00	242.00	243.00	244.00	245.00	246.00
	247.00	248.00	249.00	250.00	251.00	252.00				
FLOW	0.00	125.00	324.00	529.00	714.00	868.00	983.00	1060.00	1096.00	1113.00
	1159.00	1269.00	1371.00	3946.00	9622.00	18391.00				
SURFACE AREA=	0.	10.	19.							
CAPACITY=	0.	42.	129.							
ELEVATION=	237.	249.	255.							

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
237.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
249.0	0.0	0.0	0.

PEAK OUTFLOW IS 5330. AT TIME 20.17 HOURS

PEAK OUTFLOW IS 3211. AT TIME 20.17 HOURS

HYDROGRAPH ROUTING

CHANNEL ROUTING TO HAZARD CENTER

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
HAZARD	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0500	.0400	.0500	227.0	240.0	1400.	.01000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 240.00 135.00 235.00 755.00 230.00 1045.00 229.00 1055.00 227.00
1065.00 229.00 1615.00 235.00 1665.00 240.00

STORAGE	0.00	.08	.30	.69	4.45	13.47	25.92	41.62	60.56	82.75
	108.18	136.85	168.65	201.64	235.20	269.30	303.97	339.19	374.97	411.31
OUTFLOW	0.00	4.21	26.73	56.99	298.91	1419.45	3577.78	6792.33	11167.68	16809.31
	23820.99	32304.03	42753.98	55671.82	70087.46	85948.25	103213.63	121851.56	141836.44	163147.61
STAGE	227.00	227.68	228.37	229.05	229.74	230.42	231.11	231.79	232.47	233.16
	233.84	234.53	235.21	235.89	236.58	237.26	237.95	238.63	239.32	240.00
FLOW	0.00	4.21	26.73	56.99	298.91	1419.45	3577.78	6792.33	11167.68	16809.31
	23820.99	32304.03	42753.98	55671.82	70087.46	85948.25	103213.63	121851.56	141836.44	163147.61

MAXIMUM STAGE IS 231.5

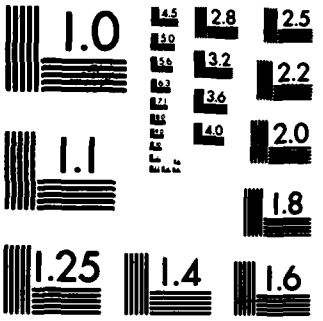
MAXIMUM STAGE IS 230.7

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

				RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN	RATIO 1
				.30
HYDROGRAPH AT	INFLO	5.20	1	2221.
		(13.47)		(62.88)(
				2221.
				(62.88)(
ROUTED TO	OUTLO	5.20	1	5740.
		(13.42)		(168.20)(
			2	2218.
				(62.82)(
ROUTED TO	CHANLO	5.20	1	5824.
		13.47)		(164.90)(
			2	2218.
				(62.82)(
	COMBLO	5.20	1	5861.
		13.47)		(165.95)(
				2217.
				62.79)

AD-A145 565 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
UPPER GLEN (GREENFIEL..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 81

UNCLASSIFIED F/G 13/13 NL



PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	466.00	466.00	470.50
STORAGE	58.	58.	80.
OUTFLOW	0.	0.	741.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	472.02	6.52	117.	5861.	9.83	20.00	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	466.00	466.00	470.50
STORAGE	58.	58.	80.
OUTFLOW	0.	0.	741.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	473.66	3.16	98.	2217.	10.17	19.83	0.00

PLAN 1 STATION DS-1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	5838.	296.3	20.00

PLAN 2 STATION DS-1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	2217.	293.6	19.83

PLAN 1 STATION DS-2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	2207.	244.3	20.17

PLAN 2 STATION DS-2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.30	2212	243.1	20.00

ROUTED TO	DS-1	5.20	1	5830.
		(13.47)	(	165.32)(
			2	2217.
			(	62.77)(
ROUTED TO	DS-2	5.20	1	5227.
		(13.47)	(	148.02)(
			2	2212.
			(	62.65)(
ROUTED TO	GREEN	5.20	1	5330.
		(13.47)	(	150.93)(
			2	2211.
			(	62.62)(
ROUTED TO	HAZARD	5.20	1	5218.
		(13.47)	(	147.76)(
			2	2211.
			(	62.62)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	526.00	526.00	533.00
STORAGE	92.	92.	143.
OUTFLOW	0.	0.	2160.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	533.03	.03	143.	6350.	.25	19.90	19.33

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	526.00	526.00	533.00
STORAGE	92.	92.	143.
OUTFLOW	0.	0.	2160.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	533.06	.06	143.	2218.	1.00	19.67	0.00

PLAN 1 STATION CHANLO

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	5824.	474.3	19.83

PLAN 2 STATION CHANLO

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	2218.	471.6	19.67

1 SUMMARY OF DAM SAFETY ANALYSIS

1

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	237.00	237.10	249.00
STORAGE	0.	0.	42.
OUTFLOW	0.	13.	1371.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	250.24	1.24	56.	5330.	4.67	20.17	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	237.00	237.10	249.00
STORAGE	0.	0.	42.
OUTFLOW	0.	13.	1371.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	249.33	.33	45.	2211.	4.83	20.17	0.00

PLAN 1 STATION HAZARD

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.30	2210.	231.5	20.17

PLAN 2 STATION HAZARD

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.30	2211.	230.7	20.17

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INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY | MO | YR
MA	49	NED	MA	011	01				UPPER GLEN RESERVOIR DAM	4239.0	7336.9	05MAR81

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
GREENFIELD RESERVOIR DAM	UPPER GLEN (GREENFIELD) RESERVOIR

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	06	GLEN BROOK	GREENFIELD	4	18000

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	(28) IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)	(29) DIST	(30) OWN	(31) FED R	(32) PRV/FED	(33) SCS A	(34) VER/DATE
PGHLEN	1912	S	48	48	143	92	NED	N	N	N	N	

(35) REMARKS
CRACKING WEST SIDE SPWY TRAINING WALL

(36) D/S HAS	(37) SPILLWAY CREST LENGTH	(38) SPILLWAY TYPE	(39) SPILLWAY WIDTH (FT.)	(40) MAXIMUM DISCHARGE (CFS.)	(41) VOLUME OF DAM (CY)	(42) POWER CAPACITY INSTALLED (MW)	(43) POWER CAPACITY PROPOSED (MW)	(44) NAVIGATION LOCKS NO	(45) LENGTH (FT.)	(46) WIDTH (FT.)	(47) LENGTH (FT.)	(48) WIDTH (FT.)	(49) LENGTH (FT.)	(50) WIDTH (FT.)	(51) LENGTH (FT.)	(52) WIDTH (FT.)
2	270	U	45	2100	20000											

(53) OWNER	(54) ENGINEERING BY	(55) CONSTRUCTION BY
TOWN OF GREENFIELD	CHARLES J DAY	UNKNOWN

(56) REGULATORY AGENCY			
(57) DESIGN	(58) CONSTRUCTION	(59) OPERATION	(60) MAINTENANCE
NONE	NONE	MA DEGE	MA DEGE

(61) INSPECTION BY	(62) INSPECTION DATE DAY | MO | YR	(63) AUTHORITY FOR INSPECTION
URBIEN & GENE ENGINEERS	03DEC80	PL92-367

(64) REMARKS

END

FILMED

10-84

DTIC